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Notes and Comments

Industrial Spectum Analysis

WE publish this week the first of a series of articles by Dr. C. S. Hichten and Mr. C. J. D. Gair on the use of the spectrograph in analytical work. This novel feature is not put forward as a complete statement of a rather difficult subject, but rather as an introduction and an incentive. It is hoped that the complete series will serve to elucidate what to many remains somewhat of a mystery. Since Hartley's pioneer work, in 1884, much has been achieved with the spectrograph as an analytical instrument, but much still remains to be done before spectrography can be considered as an established technique in the works laboratory. That it is quickly settling down to well defined paths admits of no doubt, for already, and indeed for some time past, the British Non-Ferrous Research Association has maintained a whole-time research worker (Mr. D. M. Smith), whose investigations are published from time to time. This is sufficient indication in itself of the importance attaching to the comparatively new method of analysis. The immediate need for further progress is the addition to existing curricula of applied spectrography by the universities of the British Isles. Only by these means will it be possible to guarantee the coming generation of chemists feeling as much at home with a spectrograph as they are at the present time with balances and other laboratory apparatus. Nothing but good to chemical industry can accrue from such proceedings, and yet it is a fact that with certain notable exceptions, of which the Bedford College for Women is an outstanding example, spectrum analysis is almost unrecognised as a definite subject for instruction at the present time.

In addition to this it is desirable that elementary schools be equipped with simple apparatus which would form the basis for more advanced instruction later on. When the importance of applied optics generally is remembered, it is a matter of surprise that such has not already been done. Anything which leads to new ideas in industry is surely worthy of attention by the authorities concerned. It seems as though the Board of Education itself needs educating in this matter. Coming to the standpoint of the manufacturer himself, it is difficult to think of anything more likely to attract customers than the statement that products are under spectroscopic control. Finally, it may be mentioned that the fear of certain chemists that the introduction of a spectrograph into their laboratories might tend to prejudice their position and prospects is entirely without foundation. It is obvious that only a worker trained in the use and theory of scientific instruments could hope to control successfully the more delicate operations involved, and while unskilled workers can, and do, operate a kind of spectroscope in the sorting sheds of many steelworks, it needs scientific training of no mean order to operate a logarithmic wedge sector and interpret the results correctly. Such being the case any chemist who is able to perform the double rôle of chemist and physicist at once assumes a stronger position than before. Nowadays, more than ever, "Knowledge is power."

De Commonsensibus

MR. M. D. PERRINS, Secretary of the Poisons Board, attended a meeting convened by the Association of British Chemical Manufacturers at Burlington House on July 4, to discuss the interpretation of the draft Poisons List and Rules recently issued by the Poisons Board. Mr. J. Davidson Pratt, general manager of the Association, presided, and the meeting was attended by representatives of sevaral interested organisations. A verbatim report of the proceedings has been issued by the Association (price 1s. 2d.). The report, running to something like 25,000 words, serves to show that manufacturers and sellers of poisons will be confronted with an enormous number of complicated questions when the List and Rules comes into operation. Mr. Perrins answered a great many questions with much consideration and clarity, but the conclusion to be drawn from a perusal of the report as a whole is that those who are entrusted with the administration of the List and Rules are likely to have a difficult task.

Some satisfaction, however, is to be derived from the promise made by Mr. Perrins that they will be guided by the rule of "de commonsensibus." In every set of regulations, especially intricate regulations of this kind, it is always possible to discover apparent anomalies, but these Rules are to be administered by those who may be trusted to act with common sense, and Mr. Perrins suggests that it is not necessary to strive to discover academic points which will never arise in practice. The rules are rules only, and not an Act of Parliament. The philosophy of the Act was that the control of poisons was such an intricate and complicated matter so liable to change, that it was impossible to deal with it by restrictions set out in an Act, and it was necessary to have elasticity and must therefore be dealt with by regulations which could be altered from time to time. As Mr. Perrins pointed out, the department would deprecate the suggestion that they should be altered as regards their general structure, or at all frequently, but should any new poison arise in industry

and become sold to the public, it is the intention to schedule it and put it under the various schedules as necessity may dictate. On the other hand, should it be found that the rules work harshly on, say, the trade in a particular raw material which does not, in practice, afford danger to anyone, a fact which may have been overlooked, then that can be dealt with by a rule adding it to the general exemptions or special exemptions, as the case may be. There is complete elasticity, and that has always been the intention. Each case can be dealt with on its merits.

Hydrogenation Research

THE subject of hydrogenation appears likely to interest the chemical industry even more than by reason of the great developments now taking place at Billingham. As work upon the subject is pursued it becomes increasingly clear that the process may be applied to a considerable range of materials and may be used to produce effects that were formerly obtained by quite other methods. Hydrogenation, in the strict scientific sense of the term, has been known for many years and has become through the instrumentality of nickel catalysts one of the standard processes of the chemical industry. For this reason the Fuel Research Board is now to be congratulated on calling the process which it is investigating, and which is in use at Billingham, " hydrogenation-cracking." This term is used in the two reports just issued on the subject by the Fuel Research Board, which summarises the hydrogenation-cracking of tars. Much of the information contained in these reports relates to work that was conducted some considerable time ago, and it is pertinent to ask why the Board does not take more care to issue reports promptly. Work which is concluded might as well have never been done if no one is told about it. The hydrogenation-cracking of liquid products is of more general interest than that of coal, because it lends itself to more general application. The heavy capital expenditure and the close technical control needed for a coal hydrogenation plant place the process beyond the scope of most works, but it appears that in time the treatment of tars and oils by this process may be the commonplace at coke ovens and tar distilleries, to say nothing of the larger gasworks.

Certain of the conclusions may be stressed from this angle. In the first place a suitable catalyst has been found in molybdenum sulphide and means have been found to deposit this substance upon granular alumina gel so that it can be used and subsequently revivified satisfactorily. It is found that the lower the temperature at which coal oils are produced from the parent coal, the easier they are to convert into low-boiling stable oils. The process, of course, involves two separate and distinct stages, which must nevertheless concur closely. In the first place the combined action of temperature and pressure—particularly temperature—is to crack the more complex molecules, thereby forming unsaturated, unstable molecules which perhaps are so unstable that they can have none other than a momentary existence; during that moment of existence, the unsaturation must be satisfied by hydrogenation, the second stage of the process, if excessive quantities of gas are not to be formed. If the oils have already been highly decomposed, there is naturally some difficulty in causing the first stage of the process to take place at temperatures low enough to effect the second stage without undue formation of gas, hence the need for catalysts to increase the velocity of the hydrogenation reactions. Low-temperature tars and oils can be treated very successfully; creosote oil is more difficult; whilst high-temperature tar, undistilled, cannot yet be treated as an entity.

Sources of Hydrogen

ANOTHER important phase of the work of the Fuel Research Board is the examination of the use of sources of hydrogen other than the commercially pure gas. The provision of hydrogen is the greatest single charge upon the process, and if water gas, coal gas or some similar cheap material containing upwards of 50 per cent. of hydrogen could be used instead, the process would at once become a possibility for the smaller manufacturer. The Fuel Research Board concludes that none of these substitutes is as yet feasible, though coal gas is the best of those examined. There is some doubt whether the adverse conclusion is justified, and this arises from the fact that although technically the results in terms of products may be worse, the cheaper cost of materials may cause the use of coal gas, or at least of the end gas from the carbonising process, to be profitable economically. The Board seems unable to bring itself to earth by a consideration of the economics of the processes into which it is engaged in making investigations. It can be readily understood that the percentage possibility of error is greater than when dealing with ascertainable facts, but at least some indications might be given regularly in the reports which should enable the commercially minded to form their own conclusions as the £ s. d. of hydrogenation-cracking of oils and other processes. An interesting offshoot of hydrogenation-cracking as applied to oils is the refining of crude benzol by hydrogenation. If the normal losses are of the order of 10 per cent., hydrogenation appears to have distinct possibilities, but if they are less, as when the inhibitor process is used, it is a little doubtful how far savings would be affected. The benzol with hydrogen is passed over the molybdenum sulphide catalyst at a temperature of 400 to 420° C., at which temperature very little cracking to permanent gas takes place, the combined sulphur is almost completely converted to H_2S and those constituents that tend to form gums are hydrogenated to stable oils. Experiments show that there is almost no alteration in the boiling range of the spirit when this process is used, that the sulphur content—a most important point—is reduced to negligible quantities, below 0.05 per cent., and that the gum-forming constituents are reduced to below 17 per cent. of their original figure.

Another observation of some interest is that motor spirit and lubricating oil can be produced by the hydrogenation-cracking of rubber. This may be important for use in rubber-producing countries, where there is a surplus of production or where the raw rubber can be produced very cheaply; the exact meaning of the term " very cheaply " does not appear. The rubber can be passed through the apparatus continuously when made into a solution consisting of 50 per cent. rubber and 50 per cent. hydrogenation product. By regulating the reaction temperature, the relative yield of gas, light spirit, and lubricating oils can be governed to a considerable extent.

Industrial Spectrum Analysis—I.

By C. S. Hitchen, Ph.D., A.R.C.Sc., and C. J. D. Gair, O.B.E., F.C.S.

IT is difficult to state by whom the foundations of quantitative spectrum analysis were actually laid, but prominent among the pioneer workers in this field were R. W. Bunsen and G. Kirchhoff (1861), J. Lockyer (1873) and W. N. Hartley (1884). The new method was somewhat slow in its early development, but subsequently came under the influence of the industrial competition of post-war years. This served to mould it into a coherent whole and finally establish it in works laboratories throughout the world. Once the interest of technologists was thoroughly aroused new technique came rapidly into existence, and there now exists a recent literature almost embarrassing in volume and constantly increasing.

During the past year or two a particularly large number of papers has been published, and a survey of these shows that much of the work is highly specialised in character. In view of a general desire for a more comprehensive account of the subject the present articles have been written.

Advantages of Spectrography

At the outset it should be made clear that there is no likelihood of spectrography replacing chemical analysis for the *major* constituents of a sample. The newer method is, however, useful because at times it is quick, easy and certain, where the other is slow, difficult and open to doubt. It can be employed most efficiently when the same kind of material is being repeatedly examined for *minor* constituents, and is therefore of value in the routine examination of metallurgical and mineral products. In addition, it may be used to detect traces of certain elements when the amount present is so small as to elude chemical separation.

Let us now consider the general principles upon which spectroscopic methods are based. Radiation suitable for the analysis of a substance may be produced by such agencies as the flame, the arc and the spark. On passing such radiation through the optical system of a spectroscope it is split up into constituent wavelengths which may be observed as a line spectrum either visually or by photography. In regard to the actual methods of excitation, modern practice inclines to the use either of the arc or the spark, and it is of these that we propose to treat.

By employing quartz lenses and prism in a spectroscope and substituting a camera for an eye-piece, we can photograph not merely the visible spectrum but also the ultra-violet wherein so many elements give their most sensitive and characteristic lines. It was formerly thought that this latter method would supersede all others, but recently there has been a considerable revival in the use of visual instruments. The portion of the spectrum used for analytical purposes lies between wavelengths of 7,200 A in the red and 2,000 A in the ultra-violet.

Line Intensity and Concentration

Let the case now be considered in which radiation is emitted from a sample composed of two elements, and let the concentration of one of these be progressively diminished while the other is increased. At high concentrations of each element their full spectra will appear. As the diminution of one element proceeds its spectrum becomes weaker, its *fainter* lines disappearing first, followed by those of medium intensity. Thus only the high-intensity lines ultimately remain and these will become less strong as dilution increases. The amount of dilution required to bring about the actual disappearance of these high-intensity lines depends upon the nature of the particular element. Lines last of all to vanish were denoted by de Gramont "raies ultimes."

The phenomena above described are of the utmost importance since practically all quantitative spectrum analysis methods depend upon them. While it is true that line intensities are affected by element concentration this becomes of practical importance only when the percentages range low. Thus it would be impossible to detect a difference when there was a variation of from 93 per cent. to 90 per cent., but comparatively easy from 0.03 per cent. to 0.01 per cent. This is why spectrum analysis is to be recommended for the estimation of minor rather than major constituents.

In utilising the above it is usual to correlate line intensity increases of an element with its increasing percentage, and this is accomplished by examination of a series of artificially-prepared and chemically-analysed standards alongside. It is a primary requisite that such prepared standards and the actual samples for analysis have similar composition, and that the technique employed is the same for each.

Having said so much by way of introduction, the apparatus required may be considered in detail. It is usual in text-books of quantitative chemical analysis to treat of balances, weights, drying ovens, etc., before proceeding to the consideration of methods. This is a useful and simple way and one we propose to adopt. We will therefore deal with light sources, condensers and spectrographs first. To glance for a moment at the whole subject in its simplest aspect also has a clarifying influence. Briefly, we require for obtaining characteristic line spectra of varying intensities, three pieces of apparatus—1, a light source which may contain or actually be the sample under examination; 2, an optical condenser (at times not essential); 3, either a spectrometer or a spectrograph, the former for visual work and the latter for photographic methods. Line spectra so obtained may be examined for intensity either visually or by the microphotometer. These statements simple in themselves are the fundamentals of the whole technique.

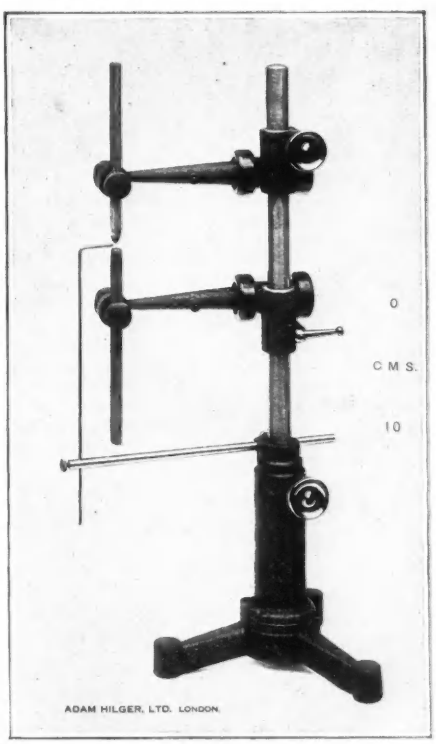


Fig. 1

The simpler form of light source is the electric arc. Fig. 1 shows a suitable stand which may be used for spark work as well. This is the de Gramont stand and has three essential features: the clamps take rods from 4 to 10 mm diameter, the insulation is sufficient for either arc or spark work, and the main support can be raised and lowered by rack and pinion in such a way that the electrodes are moved as a whole or separately while work is in progress.

It will, of course, be realised that in all spectroscopic work the results depend greatly upon the correct alignment of the light source with the spectrograph, etc.

Direct current (110 to 220 volts) is required for the arc and may be taken either from D.C. mains or from a con-

verter supplied from A.C. mains. The circuit shown in Fig. 2 consists of a variable resistance R, an ammeter A, and a voltmeter for checking the constancy of the supply current. The circuit should be designed to supply a maximum current of ten amperes.

The success of any scheme of quantitative spectrum analysis very largely depends upon the manner in which the sample is subjected to excitation, because the resulting emission must be uniform in character and quantitatively representative of the source throughout the period of observation. The very vital problem of how to secure such even and representative emission is receiving considerable attention, and as a result the position is now much more satisfactory.

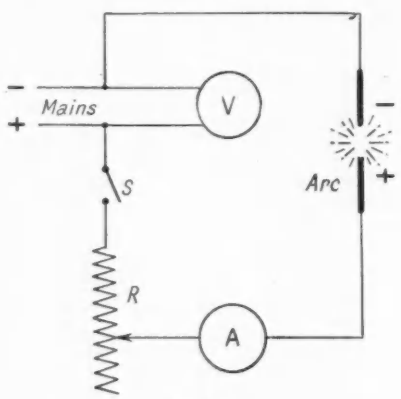


Fig. 2

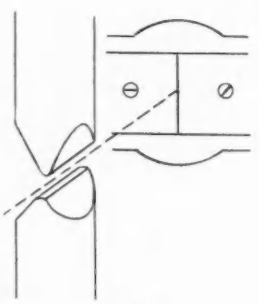


Fig. 3

Fig. 4

Methods of excitation employed in *qualitative* spectrum analysis are well established, but can rarely be used for quantitative work without considerable modification, owing to the fact that the few milligrams which normally suffice for the former cannot, in general, be regarded as forming an adequately representative sample for the latter. The amount of the sample to be consumed during emission will, of course, primarily depend upon the degree of homogeneity. Thus in the case of particularly homogeneous alloys a few tenths of a gram should afford satisfactory results, while 2 to 3 grams would not be excessive when the material consists of a powdered mineral, ore or crude chemical product.

Having these facts in mind it is well to consider the samples under their particular forms. When a sufficient length of sample in rod form is available, two electrodes are prepared from it having chisel-shaped ends. These are set in the stand already described with their ends adjacent and with the edges *parallel* to the collimator axis as shown in Fig. 3. Chisel-shaped ends serve a dual purpose as they not only prevent inaccuracies from lateral "wandering" of the arc, but render the emission more representative by confining "wandering" to a to-and-fro movement. Cases frequently arise where it is not possible for both electrodes to consist of the sample under test, and the question then has to be considered whether it should form the positive or negative electrode. After an experimental investigation of this problem, D. M. Smith has come to the conclusion that the sample should be made the *negative* electrode, as the intensities of impurity lines will then more closely approximate to those obtained when both electrodes are of the same material. Currents of 2 to 5 amperes normally prove sufficient for the analyses of rods as above and should consume sufficient of the sample to yield a representative spectrogram.

Non-conducting powders derived from the crushing down of minerals, ores, or chemical products, tend to be less homogeneous than metals and alloys, and it is consequently desirable to consume a greater quantity of the material during emission. A newly-devised method by Twyman and Hitchen enables quantities of 1 to 3 grams to be consumed during one exposure and is applicable to a particularly wide range of materials. A pair of pure graphite rods, 6 mm. in diameter, is taken, and the one intended for use as a lower electrode cored out to a depth of 3-4 cm. by means of a 4 mm. twist drill. The substance for analysis is introduced into the cavity, well pressed down and the formed electrode finally set in the stand as the lower positive pole, as shown in Fig. 4.

The light source is placed 100 to 300 cm. from the slit of the instrument, the exact distance being determined by the time required for exposure, etc. Normally no condensing lens is inserted except in those cases where space around the instrument is limited, when a negative lens may be advantageously employed. The current used varies between 5 and 10 amperes and is regulated according to the type of material being examined, 5 amps. being employed for free-burning or easily-fusible substances and 10 amps. for more refractory material.

Where the sample consists of a free-burning, easily volatile or easily fusible substance, it may prove beneficial to mix it in definite proportion either with pure powdered graphite or with an absorbent refractory such as lime or magnesia. A mixture of graphite and lime, etc., may at times be usefully employed. The sample can be mixed with a definite weight of another substance acting as an " internal standard," of which more anon.

It will be noted that in this method there are three quantities which may be independently varied, the amount of the sample, the arc current, and the distance of the light source from the slit—circumstances which render the method particularly flexible and enable the operator to select conditions best suited to the particular kind of substance under examination. The time of exposure may be varied between 5 and 20 minutes and increased accuracy is often secured from the longer period.

Liquids (solutions of metallic salts) may be conveniently used with the arc by applying a drop of them to a copper electrode (Judd Lewis), or into a carbon or graphite electrode (Löwe). Nitchie improves on this latter method by measuring the quantity of solution dropped into a cavity made in a graphite electrode—the electrode being dried previously to arcing. For routine work and approximate analysis this is exceedingly useful.

(*To be continued.*)

Preservation of Marble

New Use for Shellac

THE Indian Lac Research Institute, Ranchi, has issued for public information the results of its experiments in preventing the pitting and discolouration of polished red marble. This defect is due to the absorption of moisture-carrying soluble salts derived either from the cement used in fixing or from the backing materials. To prevent its occurrence, it is customary to treat the back and the joint surfaces of the marble with shellac, but when dowel holes are subsequently cut in the marble the shellac coating becomes ineffective. It is therefore important that the fixers should be supplied with a solution of shellac and should be instructed to apply it liberally wherever they have occasion to cut the shellac-treated surfaces. As a further precaution, fixing with Portland cement or with a plaster of the Keene's cement type should be avoided. To preserve polished marble, the best method is to repolish at regular intervals with beeswax, but this treatment will not prevent deterioration due to access of deleterious materials from the backing.

Accidents in Chemical and Allied Works

Notes from the Annual Report of the Chief Inspector of Factories and Workshops, 1934

THE development of industry in the South of England continued during 1934, states the "Annual Report of the Chief Inspector of Factories and Workshops for the Year 1934" (H.M. Stationery Office, 2s. net). During the past seven years the new industries in and around London have attracted more than half a million persons, many of them from the depressed areas. This represents an increase of some 27 per cent. in insured workers in the south-east of England, and in the southern half of the country, including the Midlands, there are now approximately 50 per cent. of the insured population of Great Britain. There is, however, evidence of a revival in some of the heavy industries, such as iron and steel, mainly carried on in the North, which may be taken as an indication of general improvement in trade.

Iron and Steel Industry

The iron and steel industry has also been busy throughout the year—another indication of returning trade. More blast-furnaces have been started in various parts of the country and new plant laid down for increasing the output of these furnaces. In the Middlesbrough district 23 furnaces were in operation, compared with 18 furnaces at the end of 1933. Two additional furnaces were started in the Rotherham district and a third is being reconditioned and will be started shortly. More furnaces have also been put in blast in Northamptonshire and the extensive modern steel works at Corby are now nearing completion. The most modern ore-crushing, grading, cintering and handling plants have been installed and are now working. New coal-washing plant and coke ovens to supply coke to the furnaces have been erected and came into action about the middle of the year, as did ancillary by-products plant producing benzol and sulphate of ammonia. These developments are only a necessary preliminary to the new steel works which are rapidly approaching completion on the same site.

At Barrow a new acid Bessemer plant has been installed having two convertors which are capable of producing 7,000 tons of steel per week. This electrically-operated plant, which replaces a smaller hydraulically-operated one, having a capacity of 4,000 tons, has made increased production possible with a decrease of 20 men employed per shift. This substitution of mechanical means for doing work of the kind previously done by unskilled or semi-skilled workers is a feature of modern industrial development.

Increase in the Number of Factories

In the North Midland division also, the increased production of steel has been a feature of the year and in most works there have been additions to the plant. There have also been interesting technical developments in the processes, improving the quality and increasing the production. In the South division the most modern blast-furnace in the country, producing at the present time 700 tons of pig-iron per day, has been started up in Essex. In conjunction with it there is a large coke oven plant, ammonium sulphate and benzol plants and an electricity generating station in the boilers of which it is hoped to burn London refuse as an alternative fuel.

At the end of the year reviewed there were 162,922 factories and 83,110 workshops on the registers of the Department, being an increase of 2,737 factories and a decrease of 3,741 workshops as compared with 1933. The number of premises of all kinds subject to inspection was 284,349. The complaints received during the year numbered 3,685. The subjects of these complaints numbered 5,012, of which 831 concerned matters outside the Department's jurisdiction; most of the remaining 4,181 related to conditions of employment, ventilation, sanitation and temperature, and about 50 per cent. of these were substantiated upon inquiry. Genuine complaints afford very valuable aid to Inspectors in enabling them to detect and rectify irregularities; the source of complaint, or even the fact that a complaint has been received, is never disclosed.

The help of the Chemical Defence Research Department has been sought in several directions. For instance, the design of an effective type of dust respirator, though delayed in order to produce a cheaper and lighter kind than was originally thought possible, is now nearly completed, and it is expected that such respirators may be made available for practical use during the current year. Research has been continued (with financial aid from the Association of British Chemical Manufacturers) into methods of detecting and estimating small quantities of toxic gases. Finally, following the series of deaths due to the inhalation of dioxan, the poisonous action of this substance has been investigated and the results published ("Journ. Hygiene," *34*, 486).

In view of the insidious nature of certain solvents, as regards toxicity, a conference was held in December to consider the action to be taken to prevent unsuspected danger in their use. As the result, the Medical Research Council has been invited to consider an investigation into the dangers of poisoning by organic solvents used in various processes, while the preparation of a leaflet embodying the precautions to be taken in their use is contemplated.

There is a marked increase in the total number of accidents reported during the year, the number having increased from 113,260 to 136,858 and the fatalities from 688 to 785. Four disasters, involving in all the loss of 25 lives, occurred during the year and call for special mention.

Premature Bursting of a Safety Disc

The first and most serious occurred in an important chemical works, and was due to the premature bursting of an aluminium safety disc in a large ammonia refrigerating plant and to the consequent escape of liquid and gaseous ammonia into the atmosphere surrounding the plant. Unfortunately this occurred at a time when a number of workmen were employed at various jobs connected with erection and maintenance in the vicinity of the safety disc. Thirteen of the men were badly gassed and eleven died soon afterwards. This plant has now been modified so as to make a similar escape impossible in future and, as an additional precaution against minor escapes, all workers operating the plant now carry respirators ready for immediate use.

The second disaster, resulting in the death of seven men and injuries to others, was due to the collapse of a grain warehouse. The collapse was due to overloading of the superstructure combined with serious defects in the pillar bases and foundations which had developed and which would have been detected if thorough examinations had been carried out by competent persons.

The third series of accidents occurred in a bleach works and resulted in the death of four boys who were severely scalded by boiling liquor when plaiting down cloth in a pressure kier. The accident was due to the inadvertent admission of boiling liquor from the heater of an adjoining kier which was being blown down. The actual presence of more than two boys in the kier was a most unusual event and was due to the addition of two boy learners to the two regular plaiters. In consequence of this occurrence a conference of the bleaching trade was arranged for by the Chief Inspector and a small committee was formed of employers, operatives and Inspectors to consider and report on the precautions possible for preventing any further distressing accidents of this nature. The committee's inquiries are well advanced and a successful solution of the problem is anticipated.

Power Transmission Machinery

In the case of the fourth disaster three men lost their lives and four others were badly burned in an explosion which occurred in a bin used for storing cork. The cork was mostly in the form of coarse chips, but contained some fine dust.

The total number of accidents due to transmission machinery was 1,143 as compared with 1,066 in the previous year. There were 38 fatalities reported as compared with 35 in the previous year. Of the fatal accidents 21 occurred at revolving shafts, while 17 were due to driving belts, ropes,

pulleys and gearing. Of the non-fatal accidents reported 143 occurred at shafting and 962 at driving belts, ropes, etc

Defective belt shifting gear has again been responsible for a number of serious accidents through machines, ostensibly at rest with the driving belt moved on to the loose pulley, suddenly starting again owing to the belt creeping partly on to the driving pulley. Two typical accidents may be mentioned. In one case a paint pug mill started up suddenly while the circular pan was being cleaned out and the revolving blades caught the worker's shirt sleeve with the result that his arm was torn off. In the other case a large dough mixer of the trough type was being cleaned out by a man who was leaning well into the machine when at rest. The machine was fitted with an interlocking cover which could only be opened when the machine was at rest with the driving belt on the loose pulley. Unfortunately the belt shifting fork was badly designed and did not move the belt sufficiently clear of the fast pulley, so that it crept slowly on to the fast pulley and set the mixing arms in motion, crushing the head of the man who was cleaning the machine. It is essential that care should be taken to see that belt shifting gear should be provided with a suitable locking device to prevent the driving belt creeping from the loose to the fast pulley and so setting the machine in motion unexpectedly.

Dangers in Operating Hoists

Hoists have again been responsible for a number of accidents both fatal and non-fatal. There is a similarity about many of the accidents mentioned in the reports, all of which point to the lamentable fact that practically every accident could not have occurred if the hoists had been properly constructed and fenced in accordance with modern safety standards. Several accidents would have been prevented if the gates at the landing doorways had been flush with the inner surface of the hoist well or if interlocking gates had been fitted on the cage; others, if the gates at landing doorways had been of the interlocked type; others, again, if proper supervision had been exercised to prevent overloading of the cage and by preventing workers from travelling in hoists intended for goods only.

The usual number of fires has occurred on premises subject to the Factory Acts, but, fortunately, few of these were attended with loss of life or injury. In Sheffield ten persons received injuries from fires caused by the ignition of celluloid; in two cases death resulted. Of the fires causing no injury most were due to the ignition, sometimes spontaneous, of inflammable material, such as oily waste, cellulose paint residues, celluloid, etc. Several fires, too, have occurred in the vicinity of cylinders containing compressed gases arising from the ignition of inflammable material near the cylinders. It is desirable that all such cylinders should be stored in a fireproof shelter away from all inflammable material and that the shelter should be so situated that in the event of fire the cylinders may be readily removed.

Safety Committees

Safety Committees have now been established in a wide variety of industries in works which do not come within the scope of the draft Order and the number has again been added to during the year. Much excellent work is being done by these committees and safety officers and it is obvious that the sympathetic views held by the officials of the firms concerned towards the safety movement, which prompted them in the first instance to set up safety organisations, has borne fruit, since Inspectors report that in many instances the activities of the committees show zeal and interest which is most commendable. In most cases the workers are represented on the committees and their assistance is found to be of great value.

Two successful safety committees were established in large gasworks during the year, one in the South and the other in the North of England. In the first works it is reported that every accident is investigated by a "jury" of twelve workers. In the second works the committee meets monthly and the workmen on the committee are paid by the company for the time spent on committee work. Many very useful suggestions have been made by the committee and adopted by the company.

At the large chemical works mentioned in last year's report 59 group and works council meetings were held and 268 meetings of individual safety committees for various departments. The suggestions received from the workers in connection with safety matters were almost double the number for the previous year and reached the large total of 2,080. Of thus number about 28 per cent. were acted upon and granted awards. The full-time safety officers were increased from two to three during the year. A feature of the year's work has been the consideration of standardising various protective appliances, *e.g.*, goggles, gloves, boots, safety belts, etc., and a careful investigation of all accidents occurring when handling goods. As over 20 per cent. of the accidents were attributed to this cause it is hoped to reduce the number considerably by introducing suitable precautions.

Another chemical works in Wales which has a strong safety organisation has achieved a splendid record. This factory is one of a group of eight works, six being in America and two in this country. In 1934 this works, employing 360 persons, succeeded in winning outright a very fine safety trophy competed for by the group. The trophy was awarded quarterly and became the property of the first factory to win it five times. They won it with a record of 609,000 man-hours without a single lost-time accident from December 13, 1933, to January 17, 1935.

Business as a Career

TRADESMAN'S ENTRANCE. By John Benn. London: Philip Allan and Co., Ltd. 3s. 6d. net.

Does business offer as satisfactory a career to the university man as a profession? What is "commercial training" really worth? Must money-making conflict with the art of living to-day? These are the questions which Mr. John Benn sets himself to answer in his new book. He finds it possible to answer the first question in the affirmative, and the third in the negative, with the necessary reservations which spring from a thoughtful mind. He explains how he has arrived at his stimulating conclusions with an engaging modesty, for a certain measure of autobiography is necessary to his argument. He found at Harrow such a profound emphasis on public and professional employment that a commercial career tended to be ruled out altogether, "since the business man appeared to be out for himself and to be concerned chiefly with making money." A salutary corrective of this fallacy was provided by a year at Princetown, where most of his American contemporaries regarded a commercial career as the normal sequel to the university. Cambridge followed, and the author took every opportunity to defend the commercial outlook in debates at the Union. When it came to settling down to a career he went into the family publishing house, having satisfied himself that on every ground a liberal education had claims to be the best training for business as for most other vocations. Mr. Benn admits that it would be absurd to suggest that a university degree is as essential for a business as for a medical or legal career, but from observing the progress of his Cambridge friends now in business he is sure that it is a real asset. He applies this dictum to commercial travelling no less than to other jobs. Competition presents obvious difficulties, its existence sometimes leading to price-cutting and bankruptcy, while its absence may mean profiteering or inefficient service. He will not accept competition as a form of war, because in practice it is usually a vital factor, without which initiative and invention would be stifled and freedom of choice would disappear both for the consumer and producer. Mr. Benn has come to realise that business offers as much scope for leadership as public life, perhaps of a more limited but certainly a more personal kind. "In the discussion of public affairs," he says, "it is not always remembered that the man who actually employs ten men is of more practical value to the community than the politician who hopes to employ a hundred men." He argues, too, that the standard of culture is gradually being raised by the normal operations of business. He gives facts and figures to disprove two widely-held theories, the first that family businesses are losing ground in face of the modern "combine," and the second that mechanisation is responsible for unemployment. Beginning at the tradesman's entrance he brings the reader in his final chapter to the front door. He is a whole-hearted advocate of adequate leisure, and illustrates from his own experience the lasting advantages of shorter hours and longer holidays. The prospect of adequate leisure and all it implies, in Mr. Benn's submission, is indeed the most hopeful and exciting that has come to mankind and, if business men will take the lead in affording opportunities for it, civilisation will be more than ever in their debt.

Chemical Industry and the Oil Problem

Further Notes on Present Position

IT was pointed out in the previous article (THE CHEMICAL AGE, June 22, pages 547-548) that many years of work have been expended upon the production of the correct catalysts for hydrogenation processes as it has not only been necessary to find that catalyst which will give the maximum degree of conversion, but also to ensure that it did not lose its activity too rapidly. For example, an iron-copper-manganese catalyst deposited upon silica gel gave a conversion of 30 to 35 grams of product per cu. metre of gas, but lost its activity by 20 per cent. within eight days. At the other end of the scale a cobalt-thorium catalyst deposited on kieselguhr gave a yield of 110 grams and did not sink to 80 per cent. activity until it had been in use for 60 days. The effect of the addition of the secondary catalysts to the main catalyst is interesting; copper, for example, facilitates the start of the reaction by lowering the initial temperature, and is effective with iron, but detrimental with nickel.

Ruhr Large Scale Plant

A large-scale plant is now in operation on this process at the works of the Ruhr-chemie, at Oberhausen-Holten, having a capacity of 1,000 tons annually, and if this installation proves successful it will be followed by a second one of very large size. According to statements in the German press, Victor Colliery, at Rauxel, contemplates the erection of a plant with an annual capacity of 25,000 tons of "petrol," the gases used in this latter installation being those not required for the production of synthetic ammonia. In practice the reaction gases, obtained either from a water-gas plant or from the treatment of coke-oven gas as set forth when dealing with methanol, are washed in a scrubber of normal design and are passed through the usual oxide boxes for the elimination of sulphuretted hydrogen; carbon disulphide and other sulphur compounds frequently present in these gases must also be eliminated as far as is possible, as they poison the catalyst. The gas is then preheated to pass under atmospheric pressure into the contact apparatus at a temperature which differs for different catalysts but which can be taken as around 200° C. The design of this apparatus is most important because the heat of reaction may be as high as 20 per cent. of the heat of combustion of the gas. Each cu. metre of the gas introduced into the apparatus will, therefore, develop some 1,100 B.Th.U.

Temperature Control

To produce the required oils temperature control is essential as any increase of temperature leads to the production of methane or, at still higher temperatures, of carbon. The lower the temperature of the reaction the better is the production of those oils which are the main purpose of the process. It is interesting to observe that for the production of methanol the temperature is of the order of 400° C. and the pressures used appear to be around 180 atmospheres.

In the "Kogasin" process the heat of reaction is abstracted from the contact mass by circulating oil, the catalyst being so arranged that the heat is readily passed into the oil tubes. The heavier oils are then condensed and lighter spirit is washed out from the gas by oils or by active carbon. Theoretically the yield of liquid products from 1 cu. metre of gas composed of 29 per cent. CO and 58 per cent. hydrogen should be 180 grams; the average yield now attained is between 100 and 120 grams, so that there is still room for improvement in the process. These yields could be increased by recirculating the gases over the contact mass. One advantage is that the apparatus is quite simple, so that the main cost is not the capital charges upon an expensive plant, but the price of coke or of the reaction gases from whatever source they may be obtained. This process is therefore to be distinguished from the coal hydrogenation process in regard to which Imperial Chemical Industries in 1931 published an estimate that a plant to produce 210,000 tons of petrol per year would cost from £7,000,000 to £8,000,000.

The methods thus far described are for the manufacture of oils by purely chemical means, starting with raw materials that can be purchased by any works. There is also among those industries that manufacture light oils as a by-product considerable activity designed to increase the yields. In the by-product coking industry this activity has reached its height. One method is based upon the known fact that the quantity of oils that is evolved from any bituminous coal is of the order of 20 gallons per ton, but that most of this is converted into gases and polymerised by the heat treatment necessary to convert the primary products into aromatic compounds. It has been attempted recently to withdraw the gases from the cool centre of the charge of coking coal in order to prevent them from being subjected to the high temperatures of the oven roof. In that way the yield of low-boiling products has been increased by 10 per cent., but, of course, those additional products are primarily paraffinoid in character and have not the anti-knock value of benzole.

The Goldschmidt Flue

Another method is the Goldschmidt flue, which is a channel situated above the normal top of the oven into which the gases pass before travelling to the outlet pipe. In consequence the gases are hardly subjected to the temperature of the oven roof (700° to 900° C.) but spend considerable time in the Goldschmidt channel at a temperature of 500° to 700° C. This temperature is the optimum for converting paraffins and some of the constituents of the tar into benzole and its homologues so that the yield of these bodies is again increased by 10 per cent. A further method is disclosed in Patent 417,201 granted to I.C.I., in which the free space above the charge is heated to 1,200° C. and then a relatively cool non-oxidising gas is introduced into the crown of the oven at the end remote from the outlet pipe. This gas may be water-gas or crude coke-oven gas from another oven. The patent states that: "If the crude gas obtained from a coke oven during the first fifth of the coking period is introduced, when at a temperature of approximately 600° C., into the crown of another oven in which coking is three-fifths or more complete and when the temperature of the crown is above 1,200° C., on the side remote from the ascension pipe, the total yield of benzole obtained from the two ovens is nearly 15 per cent. greater than that obtained from two similar coke ovens operated in the usual way. This increased yield consists of 5 per cent. due to reduced decomposition of the benzole evolved from the oven in which coking is three-fifths or more complete, and 10 per cent. due to an enhanced decomposition of the tar vapours from the oven, which is in the first fifth of its coking period." All such methods, whilst they may assist the coking works to make additional profits, cannot greatly affect the oil problem.

More Coal Should be Carbonised

The only way in which the oil situation could be ameliorated by carbonisation is for a much greater quantity of coal to be carbonised and for the oil to be treated scientifically, some being distilled off for use as light oil or diesel oil and the remainder hydrogenated, using the cheap hydrogen obtained at the end of the coking process. Unfortunately this method in its entirety is not applicable to low-temperature carbonisation, if only because the hydrogen "end gas" is retained as "volatile matter" in the coke. Low-temperature carbonisation yields a greater quantity of oil than does any other system of coal carbonisation, but it cannot live by oil and must depend upon the production of coke that can be burnt in the open fireplace. At the best such oil would only be a by-product. We import something like 1,000,000,000 gallons of motor spirit into this country annually. If 40,000,000 tons of coal now burnt in domestic grates were to be carbonised the total yield of oils of all kinds from those boiling at 80° C. to pitch could not be more than 800,000,000 gallons.

If completely hydrogenated—a process that requires no less than 18,000 cu. ft. of hydrogen per 100 gals. of raw spirit—this quantity of low-temperature tar oils would yield its own volume of oil boiling below 200° C., of which 17 per cent. boils below 100° C. It is unlikely that more than half of the completely cracked spirit would be suitable for motor spirit and the rest must be classed with heavy oil and diesel

oil. Only some 40 per cent. of our present requirements could be supplied from carbonisation by-products on the most favourable showing, and that only after many years. We visualise the carbonisation of 40,000,000 tons of coal annually by low-temperature carbonisation, but at present the amount is only of the order of 500,000 tons—and it does not grow rapidly. Moreover coke suitable for the open grate is being produced in gasworks to-day by the use of grates of a special design.

A summary of the position shows that if the present international uncertainty continues the present demand for home production of oil must dominate the oil situation.

Synthetic Fatty Acids for the Soap Industry

Continued Research in Russia

WORK on the synthesis of fatty acids by the oxidation of mineral oils has, in recent years, remained somewhat in abeyance, chiefly due to the extraordinary decline in prices of natural oils and fats and their plentiful supply. Conditions have therefore been as unfavourable for the development on a large scale of this interesting process as they have been—with similar reasons—for synthetic rubber. Owing, however, to the state of agriculture in Russia, where the cultivation of sunflower and other oilseed-bearing crops has been taken in hand, and to the urgent need of the edible fat and soap trades for such supplies as are available, attention has been concentrated on the possibility of supplementing the supply by synthetic methods.

The Russian plans for soap production aim at an annual output of at least one million tons of an average fatty acid content of 40 per cent. Some preliminary research on fatty acid synthesis by Petrow and others, at the Mendeleeff Institute and elsewhere, were thought to be sufficiently promising to justify work on a larger scale. Two experimental plants, on a semi-commercial scale, were accordingly established in Kasan and Gorkij, and chemists such as Warlamow and Petrow were placed in charge of the work.

Long-Continued Air-Blowing

Among the methods first tried was that of long-continued air-blowing, say for about 48 hours, of vaselin oil in large iron towers, of which about twenty had to be used at once owing to the slow rate of reaction. A large excess of air was used. In another series of tests, Grosny paraffin m.p. 52°, working with or without pressure and catalyst, was oxidised. A four-hour treatment of this paraffin at a temperature of 160-180° and under a pressure of 50 atmospheres in the presence of twice-normal soda solution gave yields varying from 20 to 74 per cent. With lower pressure the yield was reduced, and it was also found that in oxidising paraffin which had already been through the plant the rate of oxidation slowed down. This method, however, proved uneconomical, and further work without pressure was undertaken.

Air-blowing for 2½ to 4 hours of crude paraffin under atmospheric pressure and at a temperature of 160-170° gave a 50 per cent. yield. Continuous removal of the oxidised product was necessary in order to avoid excessive production of oxy-acids. The final product varied considerably under varying conditions. In one case 100 parts of paraffin yielded 50 per cent. of a mixture consisting of 28.5 per cent. of water-insoluble fatty acids (acid number 130-140, saponification number 190-210), 5 per cent. oxy-acids, 3.4 per cent. aldehydes, and 17.8 per cent. soluble acids. In another case, in which 52 per cent. of the paraffin was oxidised, a yield of 36-38 per cent. fatty acids was obtained; and with a 66.2 per cent. oxidation the acid yields were 44.6 water-insoluble, and 6.5 per cent. oxy-acids, together with 12.7 per cent. water-soluble acids, 2.3 per cent. aldehydes, and 33.8 per cent. unsaponifiable.

Yield of Water-Insoluble Fatty Acids

The average yield of water-insoluble fatty acids was from 45 per cent. to 50 per cent. of the oxidised paraffin. They were mostly solid, of yellow or light-brown colour, and yielded good lathering soaps. The oxy-acids amounting to 10-20 per cent. and useless for soapmaking were viscous masses of yellowish to dark-brown colour. The water-soluble acids were mainly formic and acetic acids. In this stage of the work the use of catalysts was not recommended as it neither accelerated the process nor permitted working at lower temperatures; and if there was any acceleration it merely resulted in higher yields of undesirable oxy-acids.

Petrow and his collaborators who have been working on mineral-oil oxidation for many years have usually employed sulphonated mineral oils, heated in an air current at a temperature of 90-115° in the presence of soluble metallic salts such as manganese or calcium naphthenates. The oxidation product was neutralised with alkaline lye and the resulting soap solution, freed from unsaponified oil, was decomposed with sulphuric acid to yield the free fatty acids. For the catalyst it was found that the naphthenate is more effective than the stearate of calcium or manganese used to the extent of 0.12 per cent. Yields, however, were low, not more than about 20 per cent. of total fatty acids, and of this one half was oxy-acid, though the proportion of oxy-acid declined as the yields declined :—

Time. hrs.	Total acids. per cent.	Carboxy acids. per cent.	Oxy-acids. per cent.
15	2.09	1.28	0.81
24	9.41	5.86	3.55
36	15.61	9.82	5.79
48	20.79	10.61	10.18

With a view to achieving greater purity of product some of the Russian chemists have tried working the oxidation in stages, using vaselin oil, though in other respects their methods appear to have closely resembled those of Petrow. Yields were again rather low and with excessive proportions of oxy-acids. More recent attempts, using a moderate pressure of three to four atmospheres, calcium naphthenate as catalyst, and an oxidation period of about eight hours, gave slightly better results in that the oxy-acids were less in evidence—not more than 25 per cent. of total acids, and the total yield of acids was 25 per cent. The temperature used was 112-114°. Various methods have been used for separating the oxidised from the unoxidised portions, including saponification and benzine extraction. In Petrow's German Patent 558,378 it is claimed that the amount of benzine required is considerably reduced by the use of absorbents.

Removal of Unsaponifiable Matter.

Recent work at the Gorkij Research Station indicates satisfactory removal of unsaponifiable matter from soap solutions (40 per cent. f.a.) at a temperature just over 80° C. Salting out of the soap solution is not feasible owing to electrolyte sensitivity. Various methods of purifying the fatty acids are described, but these contain little that is novel. The material most suitable for plant construction was found to be aluminium, though some types of steel, such as V2A, have proved satisfactory, but not so lead.

Numerous attempts have been made to produce a satisfactory soap from these synthetic acids and mixtures thereof with other constituents in the fat charge, but not yet with complete success. The main purpose of this research in Russia was to find suitable substitutes not only for fatty acids but also for resins (chiefly rosin) and the naphthenic acids which have hitherto been largely used in that country. The paraffin oxidation products have been tried in varying proportions with hardened (hydrogenated) fat, and hundreds of differently made up fat charges have been tested. In some cases the resulting soaps were comparable in washing and lathering powers with the ordinary Russian household soap, but for the most part they were inferior. Among the chief difficulties are those of satisfactory purifying and bleaching, with which are closely associated proper separation of the fatty acids from the unsaponifiable and oxy-acids, and keeping the formation of oxy-acids within reasonable limits. Attempts are now being made to make good use of these oxy-acids by converting them into unsaturated acids, *e.g.*, by dehydroxylating their sodium or calcium salts.

The Science and Practice of Roadmaking

Physical Properties of Road Tars and Aggregates

OUR present knowledge of bituminous materials is primarily based on chemical analysis, which does little more than reveal their ultimate composition, said Mr. W. E. Cone, technical adviser to the British Road Tar Association, in a paper presented at a meeting of the International Road Tar Conference, at Rome, on June 26. Since the physical properties of the materials are much more closely related to their proximate than to their ultimate composition, information as to the latter might still leave us in ignorance of these properties.

The physical properties of these materials are now better understood by the methods of testing that have been devised for the examination of crude, refined and manufactured products. These tests are of value in ascertaining the precise effects of the successive stages of treatment to which the crude materials are submitted, and in maintaining control of treatment and uniformity of quality. Additionally, they provide useful information for gauging the suitability of the materials for a given use, and assist in interpreting their behaviour on the road.

The General Testing Problem

Invaluable information is obtained from chemical, physical and mechanical testing, without which the engineer and chemist would be at a considerable disadvantage; but in many respects the tests still fall short of reflecting fully the quality and properties of bituminous road mixtures employed in road construction. It may be that with a greater knowledge of the proximate composition of bituminous materials we would correlate their fundamental structure with the physical properties, and determine their relation to the finished product. If means could be found of ascertaining the physical grouping of the proximate constituents, it would then be possible to suggest certain combinations which could be used as a basis for further study. From this we could proceed to consider the influence exerted upon the constitution of the materials by the various treatments, heat, mechanical, etc., all of which are associated, and will have to be combined when arriving at conclusions regarding them.

Hence one of the first steps to be taken in attacking the general testing problem is to define more closely the relationship between the physical properties and proximate composition of bituminous materials. This would give a more sound conception of their values, and form a basis for further systematic work. By what method this phenomenon of the physical grouping of the proximate constituents is to be determined remains for the scientist to discover, but with the wider range of scientific weapons now available, the problem can be attacked from new angles, and it is hoped more speedily solved.

Application of New Methods

For example, the application of X-rays and other newly-developed methods of the physicist may offer a means of investigating the materials. Additionally, the microscope may possibly afford a clue to analysis of the physical condition of the materials. While much has been achieved, the available methods for the testing of bituminous materials are not entirely satisfactory, owing largely to lack of correlation with actual road behaviour. This introduces a note of uncertainty, both as to the value of the tests themselves, and the interpretation to be placed on the results obtained by their use. It is the task of the scientist, chemist and engineer to eliminate tests of doubtful value, to implement recognised tests, and devise new methods of testing, based on fundamental research. During recent years, rapid advances have been made in our knowledge, but we have only made a beginning in the attack on a very intricate problem.

Modern knowledge of roadmaking, so far as Great Britain is concerned, dates from Macadam, who, in 1823, furnished the Government of his time with an entirely new set of principles in the matter of road maintenance and administration, upon which all subsequent progress has been based. With the advent of the petrol-driven motor car, some seventy years later, came the realisation that the time had come to seek for further improvement in the technique of roadmaking. About this time, highway authorities began to investigate the possibilities of coal tar as a binding material, and a number of experiments on a systematic basis were carried out. From then onwards, great strides were made in the preparation and application of tar for the construction and maintenance of roads, which laid the foundations of a new technique in bituminous road construction.

Present practice in the surface treatment of roads with tar is more selective in its character than in the past, and it is gratifying to note the greater care and attention which is now being given in carrying out the work. The efficient maintenance of roads calls for a plan of progressive treatment to ensure the maximum life at an economical cost, and it is in this respect that selective treatment, based on the systematic study of the surfaces concerned will produce considerably improved results over haphazard methods of application.

Road Making Under Proper Control

It seems at first surprising that it should be necessary to exercise any discrimination in the surface treatment of roads, but we have only to observe the physical condition of the surfaces presented to realise how necessary this is. Consider, for example, the initial treatment of waterbound macadam, bituminous macadam, cement concrete and wood-block pavements. Then, by way of contrast, visualise the after-treatment of the same roads, and then consider them all in relation to the changing conditions of traffic, and the safety of the surface.

A well-drained, strong foundation is the first essential in modern roadmaking, and where necessary, proper corrective measures should be taken to ensure its stability and permanence. Secondly, the value of careful and comprehensive preliminary studies cannot be overestimated in determining the best type of construction to meet traffic demands. Thirdly, the mineral aggregate should possess sufficient toughness and resistance to abrasion to withstand the impact of traffic. Fourthly, the grading of the aggregate should be controlled very carefully to obtain a mixture of the requisite degree of density consistent with the amount of traffic it will have to support. Fifthly, the selection of tar should be based on securing a quality and viscosity best suited for any particular aggregate, and the amount necessary for any given mixture should be carefully determined. Finally, the temperature of the tar and aggregate should be carefully controlled at the time of mixing.

From this it will be evident that there are a number of factors requiring special attention in the manufacture and laying of tarmacadam, and it is clear that there is a reciprocal dependence between them. Thus it is natural to conclude that the most efficient results will only be obtained when the operations are co-ordinated and under proper control.

Improved Road Surfacings

It is satisfactory to record that there has been of late a marked improvement in the design and structural efficiency of tarmacadam surfacings, which has been largely brought about by the use of higher consistency tar, and a more uniform grading of the aggregate. The results of the advancement so far achieved show clearly the increased resistance of properly balanced mixtures of tar and aggregates to deformation under such stresses as are imposed upon the surfacing by heavy traffic conditions. The modern tendency is to produce a more dense mixture by a much smaller proportion of voids than that usually associated with tarmacadam in the past. In this connection, experience has shown the desirability of incorporating with the aggregates, suitable quantities of mineral filler. The stability of the mixture increases as the voids in the aggregate decrease, provided the proper amount of tar is used. By varying the size and grading of the aggregate and the viscosity of the tar, it is possible to control the stability of the mixture in relation to whether the roads are designed to carry light, medium or heavy traffic.

Concurrently with these advances has come the develop-

ment of semi-hot and hot-process tarmacdam (tar concrete), which has made possible the construction of quick-setting surfacings capable of meeting very heavy traffic demands. The advantages to be derived by laying the mixture in the heated state are principally concerned with the binder and the consolidation of the material. In the first place, it enables a tar of improved physical properties to be used. Secondly, the mixture possesses a higher degree of plasticity at the time of rolling. The design of these mixtures is based on securing a reasonably hgh degree of stability in the compressed surfacing, which can be effected by different combinations of aggregate and filler.

The Chemical Age Lawn Tennis Tournament

Second Round Results: Third Round Draw

ALL but one of the sixteen matches in the second round of the fifth annual CHEMICAL AGE Lawn Tennis Tournament have now been completed, and the results are as follows:

Second Round Results

SINGLES.

L. F. Grape (Borax Consolidated, Ltd.) defeated J. I. T. Jones (The Mond Nickel Co., Ltd.), 6-1, 6-3.

A. E. Munns (Paper Goods Manufacturing Co.) walk-over, G. E. Verney (The Pyrene Co., Ltd.), scratched.

D. G. Blow (The British Drug Houses, Ltd.) defeated J. S. Wilson (British Celanese, Ltd.), 6-4, 6-4.

J. Haines (Anglo-Persian Oil Co., Ltd.) defeated A. S. Marcar (Bovril, Ltd.), 6-2, 6-3.

F. G. Hawley (Anglo-Persian Oil Co.) defeated W. L. Alldis (Brandhurst Co., Ltd.), 6-4, 6-3.

R. N. B. D. Bruce (Gas Light and Coke Co.) defeated L. Maronge (Bakelite, Ltd.), 6-0, 6-1.

A. Tickner (British Celanese, Ltd.) defeated L. J. Seabrook (The British Oxygen Co., Ltd.), 7-5, 6-2.

A. C. Collins (Sparklets, Ltd.), walk-over, C. J. Songhurst (Bakelite, Ltd.), scratched.

DOUBLES.

F. R. O. Allen and R. A. J. Bennett (Nobel Chemical Finishes, Ltd.) defeated H. A. C. Sibley and A. C. Collins (The British Oxygen Co., Ltd., 6-4, 4-6, 6-4.

R. N. B. D. Bruce and E. H. M. Badger (Gas Light and Coke Co.) walk-over, R. George and R. C. Pennington (J. Crosfield and Sons, Ltd.) scratched.

C. G. Copp and R. D. Hayman (Doulton and Co., Ltd.) defeated L. Maronge and J. Hudson (Bakelite, Ltd.), 9-7, 6-4.

V. J. Prosser and A. Baxter (John Haig and Co., Ltd.) walk-over, F. C. White and A. W. White (Howards and Sons, Ltd.) scratched.

S. Harbour and A. J. Webb (Williams (Hounslow), Ltd.) defeated H. A. Steel and F. G. Crosse (Society of Chemical Industry), 6-3, 6-2.

E. G. Almond and G. Barnett (Bakelite, Ltd.) walk-over, R. Tinkler and A. E. Triggs (Murex Welding Processes, Ltd.), scratched.

J. Haines and F. G. Hawley (Anglo-Persian Oil Co., Ltd.) defeated R. F. Porter and R. S. Law (Howards and Sons, Ltd.), 6-1, 6-3.

The remaining match is that in which D. G. Blow and V. G. Cripps (British Drug Houses, Ltd.) are due to meet A. E. Willshere and L. F. Grape (Borax Consolidated, Ltd.).

Third Round Draw

The draw for the third round has been made this week, and details are given below. All matches in this round must be played not later than August Bank Holiday (Monday, August 5) so that the results reach us by first post on August 6.

Singles

Hawley, F. G.
Anglo-Persian Oil Co., Britannic House, Finsbury Circus, London. (National 1212.)

v

Blow, D. G.
The British Drug Houses, Ltd., 16-30, Graham Street, City Road, London, N.1. (Clerkenwell 3000 Ext. 23.)

Grape, L. F.
Borax Consolidated Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)

v

Munns, A. E.
Paper Goods Manufacturing Co., Westmead Road, Sutton, Surrey. (Sutton 3562.)

Bruce, R. N. B. D
Gas Light and Coke Co., No. 1 Laboratory, Fulham, London, S.W.6. (Fulham 5531, Ext. 10.)

v

Collins, A .C.
Sparklets, Ltd., Angel Road, Upper Edmonton, London, N.18. (Tottenham 2647.)

Tickner, A.
British Celanese, Ltd., 22-23, Hanover Square, London, W.1. (Mayfair 8000, Ext. 137.)

v

Haines, J.
Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)

Doubles

Bruce, R. N. B. D., & Badger, E. H. M.
Gas Light and Coke Co., No. 1 Laboratory, Kings Road, Fulham, S.W.6. (Fulham 5531, Ext. 10.)

v

Haines, J., & Hawley, F. G.
Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, London. (National 1212.)

Copp, C. G., & Hayman, R. D.
Doulton & Co., Ltd., Lambeth, London, S.E.1. (Reliance 1241.)

v

Blow, D. G., & Cripps, V. G.
The British Drug Houses, Ltd. 16/30, Graham Street, City Road London, N.1. (Clerkenwell 3000.)

or

Willshere, A. E., & Grape, L. F.
Borax Consolidated, Ltd., Regis House, King William Street, London, E.C.4. (Mansion House 8332.)

Prosser, V. J., & Baxter, A.
John Haig & Co., Ltd., 2, Pall Mall East, London, S.W.1. (Whitehall 1040.)

v

Almond, E. G., & Barnett, G.
Bakelite, Ltd., Redfern Road, Tyseley, Birmingham. (Acocks Green 1181.)

Allen, F. R. O., & Bennett, R. A. J.
Nobel Chemical Finishes, Ltd., Wexham Road, Slough, Bucks. (Slough 528, Ext. 210.)

v

Harbour, S., & Webb, A. J.
Williams (Hounslow), Ltd., Hounslow, Middx. (Hounslow 1166).

An interesting announcement will be made shortly with regard to the date and venue for the finals and the trophies which are to be presented outright to the winner and runners-up in addition to THE CHEMICAL AGE silver challenge cups which are held by the winners for twelve months.

Lead in Building Construction

Prevention of Corrosion

A NEW edition of Building Research Bulletin No. 6 (H.M. Stationery Office, 3d. net) provides up-to-date information in meeting and preventing troubles arising from the corrosion of lead in buildings, many instances of which has been brought to the notice of the Building Research Station. These instances include corrosion due to the action of lime and cement on lead—one lead damp course examined had been reduced to paper thickness in fifteen years from this cause. Other examples frequently met with were the corrosion of lead sheet laid on insufficiently seasoned timber, particularly on oak, in roofs, and of buried lead pipes attacked by constituents of the soil. One serious but very unusual case reported was in a pickle factory where vinegar fumes attacked the lead-covered metal glazing bars in the roof with the formation of the poisonous dust of white lead.

Curiously, lead is very resistant to the attack of most strong acids, hence its wide use in chemical engineering, but is rapidly attacked by many weak acids. When exposed to the atmosphere it is also very durable since the carbon dioxide in the air causes a protective film to be formed which prevents further oxidation. A similar film is formed in lead water pipes and so generally protects the water from contamination.

As regards the prevention of corrosion, research has shown that moisture in oxygen must be present before lead is severely attacked. Hence a damp course can be protected by a layer of bitumen; this will protect the lead until with the passage of time the mortar has become completely carbonised and so inert. Bitumen felt also will provide protection in other cases, for example, from the acids in roofing timbers, especially if the lead sheets are so laid that no moisture can leak in. Buried lead pipes can be protected by packing them round with chalk, limestone or well carbonated mortar.

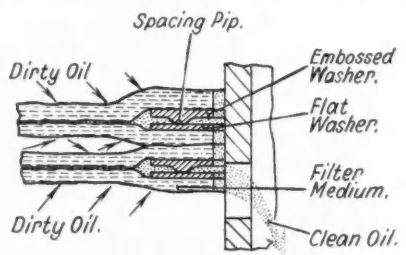
Filtration of Lubricating Oil in Service

By J. A. PICKARD, A.R.C.S., B.Sc., F.I.C.

LUBRICATING oil in service invariably collects extraneous matter which interferes with its full efficiency, and this is most marked in the case of internal combustion or compression ignition engines. Taking the case of the ordinary motor car or lorry, the preservation of the oil in a good state is vital to the efficient performance of the car, and to keep the oil in this state entails the removal of particles of iron, oxide of iron, silica, dust and hairs, and also the so-called "colloidal carbon" produced during the explosion stroke. The oil during use also collects a certain amount of petrol, which is usually termed "dilution," but this is not usually considered injurious to the proper behaviour of the oil, because the proportion of petrol absorbed reaches a maximum very early in the life of the oil in the engine, after which a state of balance arises in which further petrol being introduced is offset by petrol evaporated and got rid of. Lubricating oils for motor cars are usually specified, so that they are slightly too thick for use when brand new but reach the correct viscosity when they have absorbed a small percentage of petrol.

An Ideal to be Striven For

It will be obvious that of the various suspended materials mentioned above some are more injurious than others, and there have been various schools of thought from those who contend that so long as the actual gritty matter is taken out all will be well, to others who maintain that any material which is not oil is better out of the way. While the practical



Motor Car Oil Filter.

difficulties which might have to be overcome in the elimination of everything extraneous from the oil might induce one to put up with some proportion of the finer materials in suspension, it will not be seriously contested that a perfectly clean oil is the ideal to be striven for.

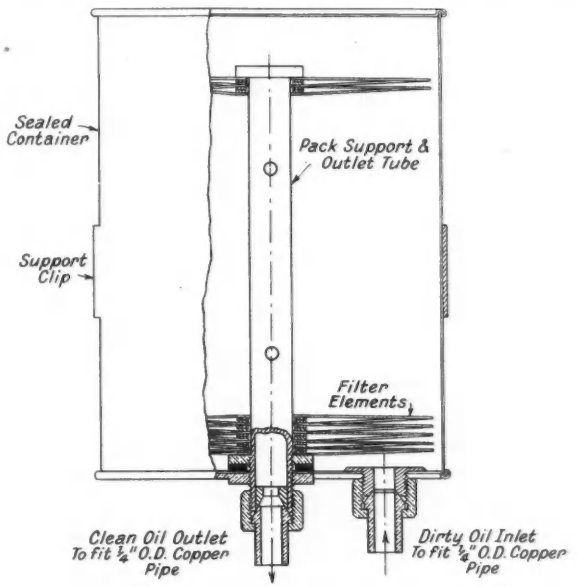
Arising from the views expressed above, filters of a wide range of types have been put forward at one time or another, such as wire gauze strainers, cloth filters, magnetic filters, cloth reinforced with kieselguhr, and metallic edge filters, some of them equipped with self-cleaning arrangements, such as scrapers or back-flushing arrangements. None of these have proved fully satisfactory, and of late years a counsel of despair, or at least a compromise, has been adopted by using plain cloth filters. These consist merely of bags of fairly coarse filtering cloth which make no claim to do more than remove the coarser suspended matter from the oil. These, in view of their cheapness and freedom from trouble in manipulation, have no doubt been worth fitting, although the actual purification which they produce cannot generally be described as more than mediocre.

The latest type of filter for lubricating oil in association with internal combustion engines has been developed by the Metafiltration Co. This new filter (or "clarifier," as it is better named) makes use of a new filtering material altogther, termed "Metafibre," which is arranged inside the filter in such a way as to be able to withstand the highest working pressures attained and to provide a very large amount of filtering surface per unit volume of filter. Both the material and the construction of the filter have been patented.

The clarifier is self-contained and has no working parts, and is mounted under the bonnet in any convenient warm position near the engine so that the advantage of the reduction in the viscosity of the oil through rise in temperature may be used in promoting the flow of oil through the filter.

Inside the filter container the filtering material is arranged in the form of some sixty "pockets," which are each formed from two discs of Metafibre material. The discs are lightly attached at the edges and through the middle a $\frac{5}{8}$-inch diameter hole is pierced. Between the Metafibre discs and concentric with the hole two thin brass rings $\frac{5}{8}$ inch internal and $\frac{7}{8}$ inch. external diameter are placed. Drainage space between the rings is provided by forming on the upper surface of the lower ring small embossings which serve to keep the rings a few thousandths of an inch apart. The pockets are then all mounted together on a drainage pipe which penetrates the central aperture and leads to the outside of the container.

When the container is closed, oil from the engine pump is passed into the body of the filter, from which it can only issue by penetrating the surfaces of the superimposed Metafibre discs and percolating between the inner surfaces to the centre of the pocket, whence it escapes by flowing between



Sealed Container Type Oil Clarifier.

the rings into the drainage pipe and is thence conducted by a delivery pipe back again into the crank-case of the engine. The general construction of the filter and arrangement of the pockets will be seen from the accompanying illustration.

Two Years' Test

This clarifier has now been under test for about two years, during which it has justified the claims made for it. It can maintain in a clean and transparent condition the lubricating oil in the crank-case of a motor car for very long periods. In general, a life of 10,000 miles can be expected for the filter before the oil in the crank-case becomes dark, and during this whole running time it is not necessary to renew the oil, so that it is plain that a very considerable actual money-saving results from the use of the filter as well as the advantages which accrue from improved running due to better lubrication.

During the trials which have been undergone, cars of practically every type have been experimented with and the results have been uniformly satisfactory. In a typical case it is found that after 100 miles of running with no filter or a cloth filter the oil is definitely dark-coloured and a spot test of it discloses a heavy black centre. After the clarifier has been attached for a further hundred miles or so the oil is found to clear up and the spot test shows a ring with practically no dark centre, and this state of things continues until 10,000 or more miles of running have been accomplished.

British Overseas Chemical Trade in June

Large Decrease in Exports

THE Board of Trade returns for the month ended June 30 show that exports of chemicals, drugs, dyes, and colours were valued at £1,492,453, as compared with £1,713,603 for June, 1934, a decrease of £221,150. Imports were valued at £825,241, as compared with £870,549; re-exports were valued at £51,693.

Imports

	Quantities. June 30, 1934.	Quantities. June 30, 1935.	Value. June 30, 1934. £	Value. June 30, 1935. £
Acids—				
Acetic .. .. cwt.	12,957	11,709	24,019	18,999
Boric (boracic) ,,	3,014	2,960	2,917	2,905
Citric .. .. ,,	1,709	662	5,111	2,676
Tartaric .. ,,	2,750	3,686	11,536	15,760
All other sorts .. value	—	—	10,830	5,126
Borax .. .. cwt.	18,656	12,900	10,013	6,471
Calcium carbide .. ,,	75,348	63,019	38,355	36,235
Phosphorus .. ,,	2,300	2,889	9,010	7,888
Potassium compounds—				
Caustic and lyes cwt.	8,906	8,198	9,372	9,248
Chloride (muriate) ,,	29,939	44,720	12,894	13,575
Kainite and other mineral potassium fertiliser salts .. cwt.	4,339	6,660	666	1,203
Nitrate (saltpetre) ,,	2,851	2,694	3,376	2,111
Sulphate .. ,,	3,100	30,751	1,467	10,798
All other compounds ,,	8,698	9,710	14,544	16,843
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	15,314	3,531	4,850	1,217
Chromate and bichromate .. .. cwt.	4,562	2,185	6,616	3,000
Cyanide .. .. ,,	1,855	1,000	4,230	2,677
Nitrate .. .. ,,	3,218	73,923	922	16,344
All other compounds ,,	19,659	19,753	15,101	15,948
Other chemical manufactures .. .. value	—	—	220,408	200,247
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts oz.	111,044	87,547	9,133	7,282
Medicinal oils .. cwt.	2,170	3,257	7,476	9,355
Ointments and liniments cwt.	15	7	621	377
Proprietary medicines value	—	—	31,888	49,337
All other sorts manufactured or prepared value	—	—	42,176	42,227
Bark Cinchona (bark Peruvian, etc.) cwt.	1,311	395	4,876	1,695
Other raw or simply prepared .. .. value	—	—	33,398	28,936
Dyes and dyestuffs—				
Finished dyestuffs (coal tar) .. .. cwt.	4,625	2,701	121,159	79,206
Extracts for dyeing ,,	4,866	3,796	9,911	8,236
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	18,014	13,673	12,286	9,272
Quebracho .. ,,	18,968	36,990	11,354	22,161
All other sorts .. ,,	22,249	64,405	15,569	42,902
All other dyes and dyestuffs .. .. cwt.	819	673	4,177	15,444
Painters' colours and materials—				
White lead (basic carbonate) .. cwt.	7,904	6,816	9,242	7,823
Lithopone .. ,,	24,933	17,524	17,096	11,004
Ochres and earth colours cwt.	33,383	31,277	11,071	19,841
Bronze powders ,,	1,765	1,482	11,430	10,145
Carbon blacks .. ,,	44,828	35,616	68,407	50,564
Other pigments and extenders, dry .. cwt.	28,193	33,976	8,772	9,071
All other descriptions ,,	17,717	11,415	34,270	21,092
Total .. .. value	—	—	870,549	825,241

Exports

	Quantities. June 30, 1934.	Quantities. June 30, 1935.	Value. June 30, 1934.	Value. June 30, 1935.
Acids—				
Citric .. .. cwt.	3,991	2,241	13,319	9,430
All other sorts .. value	—	—	23,194	24,167
Aluminium compounds tons	2,221	1,791	19,059	13,829
Ammonium compounds—				
Sulphate .. tons	23,269	20,196	131,756	119,797
All other sorts .. ,,	1,243	1,190	16,325	14,419
Bleaching powder (chloride of lime) .. .. cwt.	61,700	36,146	17,406	10,179
Coal tar products—				
Gresylic acid .. gal.	178,748	116,633	14,549	9,500
Tar oil, creosote oil, etc. gal.	3,051,062	1,362,090	59,413	36,669
All other sorts .. value	—	—	13,974	9,581
Copper, sulphate of tons	6,241	4,657	84,383	62,902
Disinfectants, insecticides, etc. .. .. cwt.	31,989	23,882	65,961	47,873
Glycerine .. .. ,,	35,032	8,488	66,720	22,220
Lead compounds .. ,,	10,762	15,451	13,591	17,615
Magnesium compounds tons	432	423	10,697	8,818
Potassium compounds cwt.	6,735	5,005	14,219	9,482
Salt (sodium chloride) tons	15,795	20,179	39,123	51,907
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	444,489	300,171	107,857	73,731
Caustic .. .. ,,	171,190	137,223	105,181	77,124
Nitrate .. .. ,,	11,990	11,416	4,306	3,929
Sulphate, including salt-cake .. .. cwt.	80,609	34,066	7,885	3,091
All other sorts .. ,,	62,343	59,023	86,791	69,407
Zinc oxide .. tons	1,048	855	20,437	15,793
All other descriptions value	—	—	192,177	188,338
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts oz.	80,973	199,366	9,390	20,772
Proprietary medicines value	—	—	83,692	98,850
All other descriptions ,,	—	—	126,747	120,979
Dyes and dyestuffs—				
Finished dyestuffs (coal tar—)				
Alizarine, alizarine red and indigo (synthetic) cwt.	3,476	1,352	15,679	7,413
Other sorts .. ,,	5,822	5,256	76,202	74,206
All other descriptions ,,	16,816	15,194	22,685	20,382
Painters' colours and materials—				
Ochres and earth colours cwt.	15,448	20,727	13,368	17,538
Other pigments and extenders, dry .. ,,	15,803	38,063	22,289	37,813
White lead .. ,,	5,779	5,498	10,918	10,429
Paints and painters' enamels, prepared cwt.	43,598	35,626	111,463	93,619
Varnish and lacquer (clear) .. .. gal.	83,897	63,056	34,085	24,258
All other descriptions cwt.	26,900	34,385	58,762	66,393
Total .. .. value	—	—	1,713,603	1,492,453

Re-Exports

	Quantities. June 30, 1934.	Quantities. June 30, 1935.	Value. June 30, 1934. £	Value. June 30, 1935. £
Chemical manufactures and products .. value	—	—	16,594	21,275
Drugs, medicines and medicinal preparations—				
Manufactured or prepared .. .. value	—	—	9,411	10,567
Raw or simply prepared	—	—	12,738	17,953
Dyes and dyestuffs and extracts for dyeing and tanning .. .. cwt.	1,089	393	1,828	488
Painters' colours and materials ..	324	871	604	14,10
Total .. .. value	—	—	41,175	51,693

Far Eastern Chemical Notes

Dutch Indies

NEARLY 11,000 TONS OF COPAL were exported, principally via the port of Macassar, in 1934. The United States was the best customer (with 26 per cent.), closely followed by England (17 per cent.), and Holland (19 per cent.).

Sumatra

LEAD ARSENATE IS NOW THE PRINCIPAL INSECTICIDE used on the tobacco plantation, where it has almost entirely taken the place of Paris Green. Japan is by far the leading importing country, nearly the whole of the 1934 imports of 527 tons coming from that country.

China

AN EXTENSIVE ALUM EXTRACTING INDUSTRY exists in the Lukiang district of the province of Anhui, reports "Chemische Industrie," but very primitive methods are applied. About 20 firms of varying sizes employing in all about 1,700 hands are engaged in the industry, which produces alum to the annual value of about 110,000 Chinese dollars.

Japan

BROMINE MANUFACTURE by direct electrolysis of brine is now carried out by Yamakawa Seiyaku K.K.

ACTIVE CARBON FOR GAS MASKS is being produced at the rate of 25 tons monthly by Dainippon Kasseitan K.K.

A NEWCOMER TO THE SODIUM HYDROSULPHITE INDUSTRY is Dai-ichi Seiyaku K.K., with a monthly production of 24 tons.

SODIUM THIOSULPHATE PRODUCTION has been tripled by Shinko Kakagu and current output is said to be at the rate of 54 tons monthly.

INCREASED ACTIVITY IS REPORTED in the Korean peppermint industry, official plans envisaging a yield of 300,000 kin in the next three years. About 85 per cent. of Korean peppermint and its conversion products (peppermint oil and menthol) is exported to Europe and America.

THE KOREAN COAL INDUSTRY CO. (Chosen Chissokogyo K.K.), formed three years ago, now announces a daily throughput of 600 tons coal. Among the more important manufactured products are methyl alcohol (3,000 tons), synthetic resins (1,090 tons) and formaldehyde solution (2,000 tons).

WHITE PIGMENTS ARE BEING MADE in Japan on an increasing scale, reports the "Chemische Industrie." The lithopone output of Mitsui Kozan K.K. will shortly reach the monthly figure of 200 tons while new plant under construction at the Mukden works of Nippon Paint K.K. will result in a monthly zinc white production of 100 tons.

Letters to the Editor

Manufacture of Poisons

SIR,—Any person who ventured to suggest that only registered medical practitioners should be allowed to have control of dairy farms because the farmers were unable to count the germs in the milk and the vitamins in the eggs would receive an early visit from two doctors for a specific purpose. Yet a responsible body like the Poisons Board has the audacity to suggest that men holding the degree of Ch.B., or the diploma of the Pharmaceutical Society (estimable people as they undoubtedly are in their own professions), are, *ipso facto*, qualified to take charge of such operations as the manufacture of sulphuric acid or caustic soda.

It has often been said that a little knowledge is dangerous, but I am sure it would have been decidedly helpful to the Poisons Board.—Yours, etc.,

W. MARSDEN COATES,
B.Sc., Hons. (Lond.).

1 Milton Street,
Padiham, Lancs.

Personal Notes

MR. M. B. H. AUSSEN has been appointed a sworn paper broker by the district court of Amsterdam for Holland.

SIR HAROLD LINCOLN TANGYE, 507 Clive Court, Maida Vale, London, W., late of Tangyes, Ltd., Smethwick, left estate valued at £876 gross (net personalty £429).

MR. FREDERICK WILLIAM BERESFORD, of 15 Mornington Avenue, Fallowfield, Manchester, managing director of J. L. Cardwell and Co., Ltd., colour merchants, Manchester, left £4,114 (net personalty £2,137).

MR. RICHARD A. HAMILTON, New College, Oxford, has been awarded a Scott Scholarship in Physics, by the Wykeham Professor of Physics, for two years from the last day of Trinity term, 1935.

MISS KATHARINE MINA COURTAULD, of Colne Engaine, Essex, eldest daughter of the late George Courtauld, son of the founder of the rayon company bearing his name, left gross estate of £319,780, with net personalty £302,092.

PROFESSOR GILBERT T. MORGAN, director of the Chemical Research Laboratory at Teddington, had the honorary degree of D.Sc. conferred upon him by the University of Dublin on July 5.

MR. J. BRADLEY, assistant master at Wallasey Grammar School, is leaving at the end of the term to become chemistry master at Christ's Hospital, Horsham, the famous Blue Coat School.

SIR HARRY MCGOWAN is one of three members of a committee appointed by the Government to inquire into the need for improving the distribution of electricity in Great Britain.

MESSRS. C. R. BURCH, A. H. JAY, C. KERSHAW, J. H. MITCHELL and H. H. POTTER have been elected to Fellowships by the Board of the Institute of Physics.

DR. BERNARD SMITH has been appointed to be Director of the Geological Survey and Museum as from October 1 on the retirement from that office of Sir John Flett. Dr. Smith was educated at Grantham King's School and Sidney Sussex College, Cambridge. He is 54 years of age, a Fellow of the Royal Society, and a Fellow of the Geological Society.

MRS. K. LONSDALE, D.Sc., research worker, Royal Institution, London, has been awarded a Leverhulme Research Fellowship for 1935 for research on the subject of "Relation between structure and physical properties of organic molecules." MR. R. G. W. NORRISH, B.A., PH.D., director of studies, Emmanuel College, Cambridge, has received a similar award for research on "The mechanism of certain chemical reactions."

MR. C. H. DESCH, superintendent of the Metallurgy Department in the National Physical Laboratory, will, it is announced, deliver the Ludwig Mond lecture during the summer term of next session at the University of Manchester.

SIR RICHARD REDMAYNE has retired from the chairmanship of the Advisory Council to the Imperial Institute on Minerals, and is succeeded by Sir William Larke. Sir Richard is chairman of Berry Hill Brickworks, and a director of Berry Hill Collieries and several other companies.

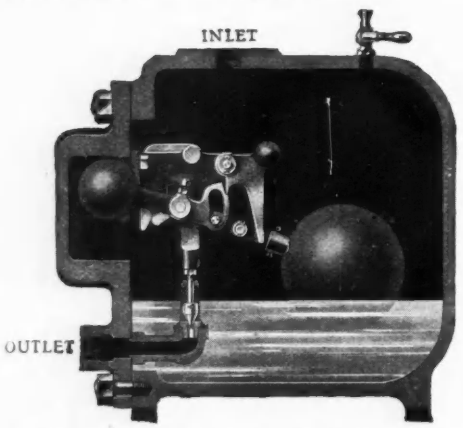
FOLLOWING the recent death of Mr. Reginald Delpech, a founder of the Triplex Safety Glass Co., important changes have taken place in the board of directors. The chairman, MAJOR A. E. PHILLIPS, has retired, and MR. GRAHAM CUNNINGHAM, formerly managing director, becomes chairman and managing director. MR. W. R. LYTTLETON remains on the board as technical director, while MISS D. MCDUELL, the secretary, who has been with the company since 1915, has been appointed to the board. CAPTAIN VICTOR SHEPERD, sales manager, and MR. A. COCHRANE, works manager of the King's Norton factory, Birmingham, also become directors. All the directors of the company are actively engaged in the business.

THE output of printing inks annually by domestic manufacturers almost supplies the requirements of the Italian market. There is, however, a small but steady market for high-quality inks for printing and engraving and for special classes of work. The demand for inks for surfacing offers the best market for foreign inks. German and French manufacturers are the principal competitors for these specialities, the former supplying between 60 and 65 per cent. of the total imports, while the latter supplies between 20 and 25 per cent.

Works Equipment News

Steam Traps for Chemical Works

THE latest design of the "Bradford" float trap, direct-operated type, is suitable for the collection of pure, hot condensed water from steam pipes and steam-heated equipment of all types, and for use in process work. This trap is made by the United States Metallic Packing Co., Ltd., and its main feature is that the float itself does not open or close the discharge valve for the water. The float engages by suitable trip mechanism a lever having a relatively heavy weight at the end, so that the valve is operated by this weight, resulting in positive and instantaneous opening and closing. As a result there is cut out entirely the slow, gradual and variable speed movement of the valve, characteristic of ordinary simple float operation merely by the change in the condensed water level in the trap, all wire drawing and



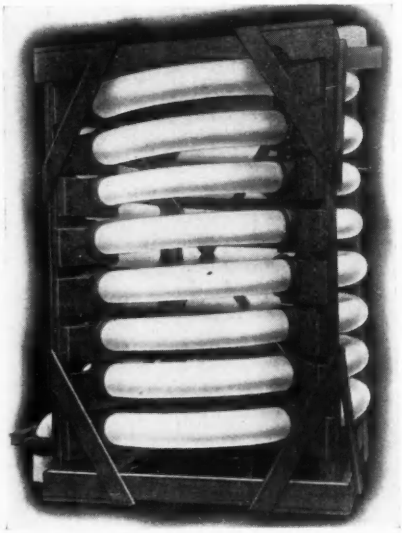
The "Bradford" Direct-Operated Steam Trap (United States Metallic Packing Co., Ltd.)

dribbling being prevented, which also applies to live steam, the design being such that the outlet is always submerged.

This trap will work with cold water and no steam pressure, so that water hammer in a pipe-line is impossible. It is made in four classes: "light" (for pressures up to 100 lb. per sq. in.), "heavy" (up to 200 lb.), "extra heavy" (up to 300 lb.), and "special" with cast steel body (for 200-500 lb. with a considerable degree of superheat). The smallest trap has a ½-¾-in. inlet pipe and a ½-in. outlet pipe, allowing of a maximum discharge of 200 gallons of water per hour (at 100 lb. per sq. in. pressure with higher duty at higher pressure). The largest trap has a 2½-4-in. inlet pipe and a 2-in. discharge, with a duty of 1,200 gallons of water per hour (at 100 lb. pressure).

Refractory Laboratory Ware

ALUMINA crucibles, boats and similar pieces are now being manufactured by The Thermal Syndicate, Ltd., who are well known as the main pioneers in fused silica ware, first placed on the market in 1906. These alumina crucibles are in two grades of porosity, high and low, and at the present time can be manufactured in sizes up to 2½ in. external diameter and 3½ in. high. They will stand an extremely high working temperature of 3,540° F. (1,950° C.) and are therefore suitable for the melting of all kinds of metals and alloys, as well as alkalis and other salts, the rate of reaction with the latter and also with concentrated sulphuric acid, for example, being extremely slow. Detailed research work by the makers is in progress in the whole field of the production and application of alumina, and it is probable that in the immediate future larger crucibles will be available.



"Vitreosil" Fused Silica Ware: large condensing coils for nitric, sulphuric, hydrochloric and other acids are now made in sizes up to 3 in. bore. x 60 ft. long, by The Thermal Syndicate, Ltd.

The main advantage of the alumina crucible, in comparison with fused silica, is the very high temperature that may be used. It will be remembered that silica melts more or less completely at about 3,090-3,270° F. (1,700-1,800° C.), although, curiously enough, volatilisation commences under this point, even as low as 2,460° F. (1,350° C.), while in general at about 2,678° F. (1,470° C.) the change-over from crystalline silica (such as quartz) to amorphous silica commences. In general, silica ware of all kinds can be used at temperatures up to, say, 1,830° F. (1,000° C.).

The method employed in manufacturing "Vitreosil" products is to melt rock crystal, geyserite (very small silica crystals) or special varieties of pure sand by electrical methods which depend upon the use of graphite rods, immersed in the product, through which a powerful current is passed. The result provides three forms of fused silica—opaque, translucent and transparent, according to the nature and properties of the original silica. The degree of transparency depends merely upon the amount of entangled gas particles, and the product is otherwise the same in each case, containing over 99.8 per cent. silica, which is then blown or melted into the desired shapes.

One of the most astonishing characteristics of silica ware is, of course, that it can be heated red-hot in a blowpipe and then thrown into cold water without any ill-effect. This is due to the low coefficient of expansion, which, within a range of 0-1,000° C., is 0.00000054 per 1° C.—about one-tenth of the best Jena glass (0.0000057) and one-seventeenth of ordinary glass. Thermal expansion is, of course, much greater in the case of alumina crucibles, which must therefore be slowly heated up and cooled down again to avoid cracking.

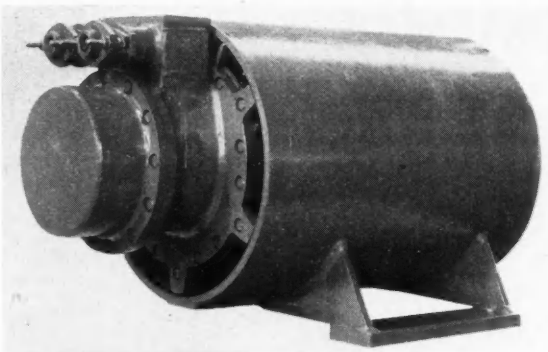
Flame-proof Electric Motors

DURING the last few years great advances have taken place in the design and construction of totally-enclosed flame-proof motors, suitable for use in explosive atmospheres. The latest "Rolling" and "Emcol" flame-proof motors, made by Laurence Scott and Electromotors, Ltd., are particularly intended for use in chemical works, explosive factories and other establishments in which open and ordinary enclosed motors cannot be used because of the danger involved.

The "Rolling" motor is available in sizes from 2-30 b.h.p. with cooling carried out by radiation through the carcase. The construction is extremely heavy and solid of welded steel, tested to an internal pressure of 150 lb. per sq. in., both on the squirrel cage and wound rotor principle (except in the smallest sizes which are squirrel cage), contained within an outer steel casing, the latter being cylindrical so

that the motors can be rolled into position. If necessary, however, the casing can be provided with welded-on feet and some other points are a flame-proof starter, steel end shields, and large diameter shafts and bearings, with special housings for the latter (on the "cartridge" principle). Only eight bolts at one end and four at the other have to be unscrewed to take off the end shafts and remove the complete rotor and its bearings intact.

For sizes over 30 h.p. mechanical ventilating has to be adopted for cooling, because otherwise the motors would have to be of enormous size and great weight, and the "Emcol" flame-proof motors, having internal self-contained



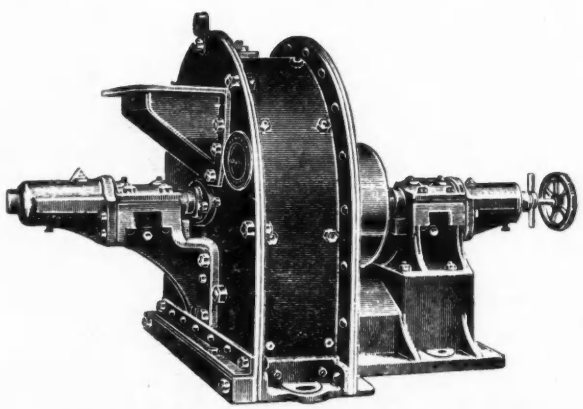
75 H.P. Interfrequency Flame-proof Slip Ring Motor, as supplied by Laurence, Scott and Electromotors, Ltd.

fan equipment, are available in sizes from 2-150 b.h.p. In constructing these motors the "Scott-Mossay" patent steel frame system is used, the stator being built up from the inside outwards, thus giving a perfectly true bore and a uniform air gap, resulting in mechanical reliability as well as a high power factor.

In these "Emcol" motors the self-contained cooling is carried out in the standard patterns by means of two cast aluminium fans attached to the shaft, one inside the motor proper and the other outside, but within the outer steel casing. The inside fan constantly circulates the heated air in the motor through the horizontal steel tubes welded on the periphery of the stator. These tubes are cooled on the outside by means of cold air taken by means of the outside fan, the air passing over and between the tubes in counter-current to the internal heated air and discharging from the end of the motor. That is the cooling which extends to the inside of the casing end plates as well as the tubes, is on the principle of heat-interchange between the cold air and the heated air, which do not come into contact, the pronounced degree of cooling being partly due to the high velocity of the air outside the tubes.

A "One-Operation" Disintegrator

THE "Devil" disintegrator, made by Hardypick, Ltd., is suitable for reducing almost any material to coarse or moderately fine powders at one operation. The machine



The "Devil" Disintegrator (Hardypick, Ltd.)

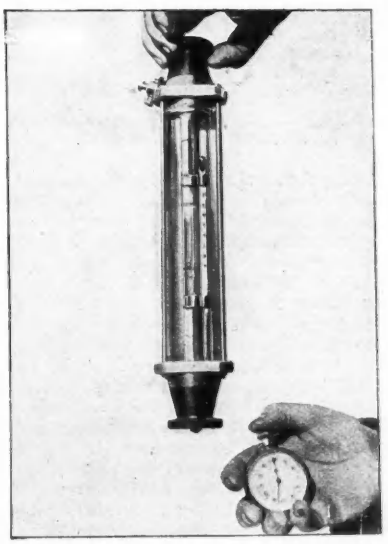
combines a percussive action of ordinary high-speed disintegrators with a perfect grinding action, which progresses step by step and gradually reduces the material dealt with to the degree of fineness required. There are two grinding rings, one fixed and the other revolving; each ring has teeth upon its face, arranged in concentric circles, with spaces between them, the teeth and the spaces decreasing in size towards the outside edges of the rings, and the teeth of each ring passes between the circle of teeth on the other. Different patterns of rings are supplied, with larger teeth for coarse grinding and smaller teeth for fine grinding. The revolving ring can be made—by means of the hand wheel—to revolve in contact with the fixed ring or at a distance from it, thus regulating the degree of fineness of material being ground while the machine is in motion or at rest.

The material to be ground passes through a hopper into the centre of the machine, and, the revolving disc being provided with arms, it is thrown, by centrifugal force, into the teeth of the grinding rings, and it must all pass between the grinding rings before reaching the outlet, a large opening at the bottom of the casing. The teeth are largest where the material first enters between them, and consequently strongest where most strength is required. The grinding rings are made of steel or of a special mixture of cast iron with the teeth chilled about halfway through them, and are exceedingly hard, and they can be replaced when worn out without skilled labour. The material is gradually reduced in passing between the large teeth and thence through the smaller ones, finally escaping through the outlet immediately the required fineness is reached, and is not operated upon again and again as in some machines. There are scrapers attached to the revolving disc which effectually prevent clogging in most materials.

The "Devil" disintegrator can be run in either direction, and when the teeth of the grinding rings are worn on one edge the other sharp edges can be brought into use by crossing the belt and running the machine in the opposite direction.

An Improved Viscometer

THE method used in the Steiner viscometer is the timing of the passage of an air bubble between graduation marks on a tube which contains the liquid, and accuracy of $\pm \frac{1}{2}$ per cent.



The Steiner Viscometer showing method of support during timing.

may be attained. The time required for an observation is roughly one-twentieth of that required for a Redwood viscometer, while the instrument is completely self-contained and portable. Used oil from an engine can be tested to measure change in viscosity and only about 5 ml. of liquid is required for a complete test.

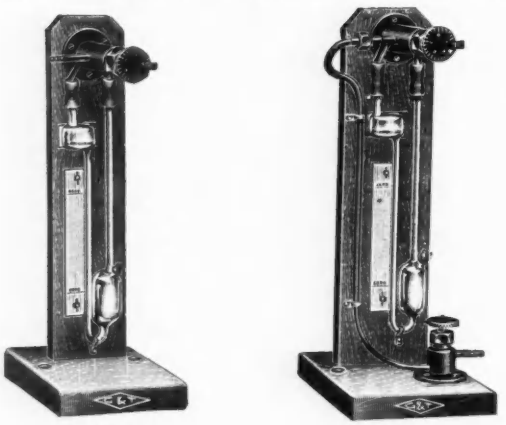
The viscometer, which is supplied by Griffin and Tatlock, Ltd., is about 30 cm. long, weighs 680 grams and consists of a graduated glass tube having three marks numbered,

and a fourth un-numbered. The tube is provided with ground-in glass stoppers and is mounted in cast duralumin holders having end caps of thermally non-conducting material. A glass jacket surrounds the viscosity tube, leaving an annular space which is almost filled with glycerine, and contains a milk-glass scale thermometer graduated 70° to 210° F. A table is supplied giving conversion of Steiner seconds into kinematic viscosity and into one of the following sets of units: Redwood, Saybolt, or Engler.

The viscosity tube is filled to the un-numbered mark. This leaves about 1.5 cm. of the tube unfilled with oil and a bubble of air corresponding to this length is enclosed when the stopper is re-inserted. The temperature of the jacket is read, and the viscometer inverted. At the end of the timed period the thermometer is again read. The time taken for the passage of the air bubble between the 0 and 2 graduations on the viscosity tube, or, in the case of very viscous liquids, between the 0 and 1 graduations, is recorded. The viscosity may now be determined from the tables.

Measured Control of Gas Flow

IN a new variable orifice flowmeter supplied by Griffin and Tatlock, Ltd., the principle of constant pressure drop across a calibrated orifice of special design has been adopted. The instrument has a practically linear scale throughout a hundred-fold range of flow rates and an overall range of approximately a thousand-fold. It has the additional advantage that the accuracy with which a stream of gas passing through



Model A **Model B**
Variable Orifice Flowmeters.

it can be maintained constant is independent of the magnitude of the rate of flow throughout the whole range covered. Two models are available. Model A, which incorporates only the special valve orifice and which should be used in conjunction with an external fine adjustment valve, and model B, in which, in addition to the valve orifice, a fine adjustment valve for controlling the gas flow is included. The general construction of the two types is similar. On a teak stand is mounted a graduated, precision orifice valve, through which passes the gas stream to be measured. The valve is provided with riffled inlet and outlet tubes for rubber tubing connection. A manometer is connected across the inlet and outlet of the valve. The head of the valve is divided, and an integral scale is also provided, giving fractional and integral openings respectively. The meter is designed for use at a constant pressure of 100 mm. across the valve orifice and the manometer is therefore provided with a suitably marked scale.

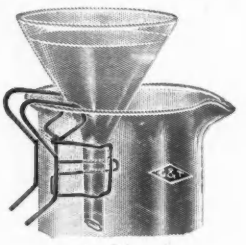
To use the instrument to give any required rate of flow within its capacity, the gas control valve is closed, the gas inlet is connected to tube A and the outlet to tube B; the orifice is set accordingly. The gas control valve is opened slowly until the liquid meniscus in the manometer rises to the upper scale mark. The required rate of flow is then obtained. To measure a gas flow the orifice valve and the control valve are both opened. Having connected into the gas system the orifice valve is closed slowly until the liquid meniscus in the manometer rises to the upper scale mark. The index and dial readings are read and the rate of flow obtained by reference to the calibration curve supplied with the instrument.

Viscosity Data for Porcelain Slip

APPARATUS recently introduced by the O. Hommel Co., of Pittsburgh, Pa., gives an accurate determination of the specific gravity and also the viscosity of porcelain enamel slip. It consists of a brass pipette, which at the narrow end is fitted with a standard thread making possibe the use of nozzles of various sizes, depending on the viscosity of the enamel to be measured. The open end of the pipette is fitted with a cap, so that the pipette can also be used for measuring the specific gravity of the enamel. In this case the pipette is dipped directly in the tank of enamel to be tested, and after the excess enamel is washed off it is wiped dry and placed on a balance to weigh. The weight gives a direct indication of the specific gravity of the milled slip. When this has been done, the finger is placed on the tip, the cap is removed, and the time necessary to drain, that is, the viscosity is established. With the acid of this pipette it is possible to reproduce and control the enamel used in dipping either ground coat or cover coat as the case may be.

A Useful Beaker Clip

THE Griffin beaker clip introduced by Griffin and Tatlock, Ltd., has been designed to overcome the inconvenience of funnel and retort stands. By its use, the vessel and the object supported can be moved as one integral unit taking up no more space than the vessel itself. The clip is made in polished staybrite steel and may be placed so that the object supported is either inside or outside the beaker. The illustration shows the clip supporting a funnel inside a beaker. The clip may be used for supporting a thermometer in a beaker, calorimeter, or freezing bath, and will grip rods from 3/16 to 3/8 in. diam., while being adaptable to vessels of widely-varying curvature.



The Griffin Beaker Clip supporting a funnel.

Better Monochromatic Light

THE Neron electric sodium lamp, which has been introduced by Griffin and Tatlock, Ltd., as the advantage of giving monochromatic radiation without perceptible heat radiation with constant high light intensity. No regulation is necessary during running; the lamp may be operated from ordinary lighting circuit by means of suitable resistance.

The monochromatic light is suitable for use with spectrometers, polarimeters, and in all optical measurements. The lamp can be supplied either for A.C. or D.C., but requires a special resistance supplying starting and running current. When purely monochromatic radiation is absolutely essential a bichromate filter or monochromator may be used to remove the lines 5680 and 6160. The intensity of these together is only about 1 per cent. of that of the D lines. The size of illuminating surface is about 10 × 15 mm. The light intensity of 4 to 6 Hefner candles per square cm. is reached in 2 to 3 minutes.

The Neron Sodium Lamp.

An Adaptable Bunsen Burner

A NEW model of the Amal laboratory bunsen burner has been produced by Amal, Ltd. The burner is adaptable to high and low pressures and normal specific gravities of gas. The ejector contains a taper needle which can be adjusted by the external screw to maintain the maximum gas velocity accord-

ing to the volume of gas consumed and the pressure available. The burner head is made from metal and chromium plated. This construction is unbreakable and permits the production of an efficient head, perforated with a large number of small holes. Adaptable loose burner heads to give various flame shapes are also supplied, including flat (horizontal), flat (vertical), round (vertical), rose (horizontal).

Industrial bunsen burners are also manufactured by the same firm in units or clusters for furnaces, boilers, and ovens. Air tubes are in cast-iron, machined true inside and concentric with ejector. Nipples are detachable and available in all sizes of "flow" according to "Amal" calibration, while heads made of chromium plated perforated metal discs are unbreakable. Models can be obtained in which the effective range of the burner at 5 in. pressure, gas sp. gravity about 0.5, is from 5cu. ft. to 36 cu. ft.

Continental Chemical Notes

France

THE USINES CHIMIQUES RHONE-POULENC in their annual report announce the centralisation of the concern's activities at three large modern factories located at Saint-Fons, Roussillon and Vitry. An unchanged dividend of 30 francs per share is declared on the increased share capital of 100 million francs.

Germany

OWING TO THE AMBIGUOUS CHARACTER of the term "artificial leather" an official definition has just been published according to which the term is applicable to all fabrics or felt-like materials derived from vegetable, animal or other fibres which possess or simulate leather-like properties and are provided with a water-resistant coating on a cellulose derivative basis, *e.g.*, nitrocellulose. This official definition is also intended to embrace cardboard-like materials with leathery properties, but containing at least 40 per cent. by weight of leather substance ("Nitrocellulose," June, 1935).

Belgium

CALCIUM CHLORIDE HAS BEEN ADOPTED as a flotation agent for coal cleaning by the Ougree Marihaye company. The quality of the final product is such that the coke therefrom can be used as an anode in the manufacture of aluminium and other light metals.

A REVIEW OF THE BELGIAN CHEMICAL INDUSTRY appears in the July issue of "L'Industrie Chimique Belge." Thanks to the cupriferous deposits of the Belgium Congo, Belgium is now a large producer both of copper metal and of copper sulphate, six works specialising in production of the latter with an annual production of about 30,000 tons. Phosphates of potassium, sodium and ammonia are produced by two concerns, the greater part of the output being absorbed by the match, pharmaceutical and other home industries. Sodium bichromate is the chief chromium salt made in the country and this branch has developed considerably with the introduction of chromium plating for motor cars. Exports have fallen to vanishing point, however, from 550 tons in 1933 to 104 tons in 1934. Arsenic anhydride is an interesting Belgian by-product of zinc metallurgy, the annual output of about 3,500 tons being exported almost entirely to England, France, Germany, United States, etc. The mineral resources of the Belgian Congo are also responsible for quite an extensive industry in the oxides of uranium and cobalt, which are mainly employed as colouring matters in the ceramic and glass industries, while a considerable proportion of the output is exported to Germany, United States, Japan and France.

ON THE FINE CHEMICAL SIDE one Belgian factory is producing benzoic acid derivatives, while a native supply of alkaloid substances is assured by the enterprise of Laboratoires Bios which also holds the monopoly in Belgium for the manufacture of anæsthetics. This concern also specialises in the production of ophthalmic preparations, to which field the Laboratoires Optima and the Meurice Division of Union Chimique Belge are also devoting much attention. Synthetic citric acid has been produced in Belgium since the war by a factory at Tirlemont, but the home market is too small to absorb the entire production, an important proportion of which is (or was until recently) consequently exported to Germany, the Argentine, Brazil, Spain, France and England. Exports have nevertheless dropped off considerably in recent years and only totalled 800 tons in 1934 owing mainly, it is stated, to the fall in the price of natural citric acid.

Russia

THE SYNTHETIC RUBBER TRUST reports the discovery of a new rubber regenerating process at the Leningrad experimental works applying solvents obtained as by-products in the production of synthetic rubber.

PLANS FOR COMBATING LOCUST PLAGUES were jointly drawn up at the beginning of June at Aschchabad by representatives of the Russian and Iranian (Persian) governments. A similar agreement was signed at Kabul between the Soviet ambassador and the Afghan authorities.

Holland

PLANS FOR THE ESTABLISHMENT of a native photographic chemical industry are under discussion. Hitherto the production of plates and films has been on a modest scale, the only firm in this field being N. V. Photax, of Soest.

FALLING-OFF IN SUPERPHOSPHATE PRODUCTION with attendant reduced demand for sulphuric acid has concentrated attention upon the possibility of establishing a copper sulphate factory. Independently of examination of the problem by the Association of the Dutch Chemical Industry, the N.V. Chemica, of Beverwik, is understood to be contemplating copper sulphate manufacture. The annual domestic consumption is about 2,000 tons ("Chemische Industrie").

Beckoning Horizon

Mr. and Mrs Wedgwood Benn's World Tour

BUSINESS is increasingly affected by political factors, and it is hardly an exaggeration to say that the booking of an order is now the simplest step in the process of shipping goods from one country to another. The complex causes of this situation give special interest to the survey of world conditions which Mr. and Mrs. Wedgwood Benn have provided in "Beckoning Horizon" (Cassell, 12s. 6d.). A visit to the Eastern States of America was extended to the Pacific coast, whence they were unable to resist the argument that every step to the next horizon was, in fact, a step homeward.

Impressions of the United States, Japan, China, Manchukuo and Russia were thus obtained in quick succession, and against this background the authors discuss such problems as the struggle for foreign markets and the world-wide issue of man and the machine—America seizing new levers of control, Japan oiling old wheels, the Soviet entirely changing the motive power. Such questions are live coals, and some readers will disagree, for instance, with the authors' interpretation of Mr. Ford's philosophy; but there is little attempt to take sides in this book, which is primarily a record of conditions observed during an unusually interesting journey.

Social life is discussed in many contrasting aspects. Religious expression is viewed in Dr. Fosdick's fashionable church on Riverside, in the paroxysms of Aimee McPherson's "Four-Square Gospel," or beside a tattered prayer flag on the Mongolian plain. The famous Ford plant is set against the Molotov at Nijni Novgorod, designed by the same engineers; the intense formalism of the Chinese theatre against the grim realism of the Communist stage. Everywhere the authors avoided the beaten track; for days at a time they journeyed by omnibus, coastal steamer, farm cart and even a sedan chair, and they were fortunate in obtaining interviews with such interesting people as General Chiang-Kai-Shek, the living Buddha of Tibet, and the Emperor of Manchukuo. The book is illustrated with many photographs and maps.

News from the Allied Industries

Glass

THE GOVERNMENT OF INDIA have rejected the proposals of the Indian Tariff Board to grant protection to the Indian glass industry. They are of opinion that the absence of indigenous supplies of raw materials which, in the United Provinces where the glass industry is to a great extent concentrated, represents 70 to 75 per cent. of the total cost of material and which even at the ports of entry represents 30 to 45 per cent. of that cost, constitutes a disadvantage to the industry which cannot possibly be balanced by any advantages which it possesses in other respects.

Artificial Silk

SPEAKING AT THE SEVENTH ANNUAL GENERAL MEETING of Cellulose Acetate Silk Co., Ltd., at Lancaster, on July 12, Sir Donald Horsfall, the chairman, said that the shrinkage in trading profits to £42,405 in respect of the past year was due to the serious reduction in turnover, caused in the earlier part of the year by the prevailing uncertainty in the trade regarding the retention of the Excise duty, and later by the uncertainty created by steadily-falling prices as the result of unnecessary competition among producers of acetate yarn. A considerably improved demand for the company's products had been experienced since the commencement of the current year, thus enabling them to take full advantage of its increased productive capacity, and thereby reducing the cost of production.

China Clay

LOOE HARBOUR COMMISSIONERS recently decided to reduce the quay dues on china clay from sevenpence-halfpenny to sixpence per ton, provided the shipper guaranteed to double the quantities loaded and to pay each of the men an extra halfpenny per ton. English Clays, Lovering, Pochin and Co., Ltd., of St. Austell, have now written to the Commissioners pointing out that they cannot guarantee to ship any stated quantity, and that assuming the customary six men were employed on the loading the new dues actually meant an increase of threepence per ton, raising the loading rate from 7d. to 10d. per ton, against which they were offered a reduction in the dues of only 1½d. per ton. The company suggested a meeting with the Commissioners for the discussion of the matter, but the Commissioners have resolved to adhere to their original decision.

IN A CIRCULAR TO HOLDERS of its 6 per cent. debentures, Lovering China Clays, Ltd., asks them to agree to an extension of the present arrangement—of distributing to them annually the net profits of the company—until March 31, 1937. Under the present agreement these arrangements ended on March 31 last, and the normal 6 per cent. interest payment was to be resumed on July 1, 1935. Sinking fund operations were also to be resumed. It is anticipated that for the year to March 31 last a payment of 4 per cent. will be made before the end of July; this compares with 2 per cent. the previous year. As regards the current year the directors declare that with the 1 per cent. interim dividend just paid on the ordinary shares of English Clays, Lovering, Pochin and Co., for the year to September 30 next, they are now reasonably confident of a further increase in profits.

THE DEMAND FOR CHINA CLAY in June was not quite as satisfactory as one would have expected, but there is still a large balance of trade on the first six months compared with the corresponding period of 1934. Had it not been for the higher graded clays now produced by special plants for specialised trades the volume of tonnage would be considerably less each month. However, the china stone section has very much improved, so much so that quarries have been working full time for some months past and there is a greater activity in the china clay pits. The shipments for June were as follows: Fowey—31,619 tons china clay, 2,531 tons china stone, 2,405 tons ball clay; Par—9,001 tons china clay, 578 tons china stone, 40 tons ball clay; Charlestown—2,714 tons china clay, 732 tons china stone; Padstow—549 tons china clay; Plymouth—212 tons china clay; Newhaven—68 tons china clay; by rail—4,898 tons china clay, making a total for the month of 57,747 tons compared with 66,696 tons in May.

Compressed Gases

ANOTHER BONUS ISSUE is promised to shareholders in the British Oxygen Co., Ltd. Presiding at an extraordinary meeting of the company on July 11, Dr. J. D. Pollock, the chairman, said that next year the company celebrated its fiftieth anniversary, and the directors had under consideration the capitalisation of part of the reserves and making a bonus ordinary share distribution. The meeting was held to approve a resolution increasing the capital of the company to £3,500,000 by the creation of 1,250,000 new ordinary shares of £1 each.

Dyeing and Finishing

MEMBERS OF THE AMALGAMATED SOCIETY OF DYERS and Kindred Trades have decided to give three months' notice to the firms connected with the Scottish Federation of Dyers and Bleachers to stop work in support of an application for increased wages. The notices become effective in September and will involve more than 3,000 employees in the Vale of Leven, Paisley, Glasgow and Carlyle. The ballot vote resulted in 94 per cent. of the members authorising the executive to give three months' notice to terminate the existing agreement. The Union asked that the minimum increased rate for men, including basis rate and cost-of-living allowance, should be 47s., and for women 29s.

Non-Ferrous Metals

THE TIN PRODUCERS' ASSOCIATION in their annual report for 1934 state that, since the last summary of the International Tin Committee's activities was submitted to members, there has been a notable stability in the price of tin. At the end of May last, world stocks of tin amounted to 18,187 tons, against a total of 60,000 tons in 1931. The price of the metal since June, 1933, has averaged £227 a ton, while the average for 1931 was £118. During 1934 further co-operation has been achieved among the world's tin producers. As a result of recent agreements, 87.7 per cent. of the world production of tin is now controlled.

THE BAVARIAN ALUMINIUM CO., of Munich, which is controlled by the German Government, has decided to construct a new water power plant on the River Inn with an annual production of about 400,000,000 kWH. Last year the company produced 520,000,000 kWH, so that in future almost 1,000,000,000 kWH may be produced there, the power to be used for the production of aluminium and synthetic nitrate. This plant is a further step forward to the aim to increase the German output of aluminium which is scheduled to reach by the end of 1935 about 71,000 metric tons annually, compared with 65,000 metric tons expected for the whole of 1935. In 1934 the German aluminium output was only 37,200 metric tons, and in 1933 it was only 18,900 metric tons.

THE LEADING BELGIAN ZINC PRODUCER has circulated former members of the International Zinc Cartel, suggesting the convocation of a new conference to discuss the re-establishment of the Cartel. The British 10 per cent. import duty was one of the main factors in the breakdown of the International Zinc Cartel at the end of last year. German zinc output so far this year has just doubled, compared with the corresponding period a year ago, due principally to activity at the new Giesche zinc smelter. The world output of zinc during the first five months of 1935 increased to 600,500 short tons from 526,800 short tons a year ago, of which 175,300, against 158,400 short tons, were produced in the United States.

THE Chemical Industry Union of the Republic of Poland, Warsaw, is the central and most important trade association of the Polish industry. It comprises 107 members from all branches of the industry, representing 250 manufacturing units. The union includes the following sections: tar products, pharmaceutical, fat, paints and lacquers, artificial fertilisers, turpentine and export. Other important trade associations in the chemical industry are the coke, superphosphate manufacturers', pharmaceutical, perfumery, carbondioxide union and sulphuric acid unions. Excepting the pharmaceutical association, all other associations are members of the Chemical Industry Union.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	July 16.	July 9.
Anglo-Iranian Oil Co., Ltd. Ord.	60/-	60/-
,, 8% Cum. Pref.	36/3	36/3
,, 9% Cum. Pref.	37/6	37/6
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	4/8¼	4/8¼
Associated Portland Cement Manufacturers, Ltd. Ord.	56/6	53/6
,, 5½% Cum. Pref.	27/-	27/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	61/3	33/9
Bleachers' Association, Ltd. Ord.	6/-	6/-
,, 5½% Cum. Pref.	9/4½	9/4½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	21/3	21/3
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/-	49/3
Borax Consolidated, Ltd. Pfd. Ord. (£)	95/-	95/-
,, Defd. Ord.	16/-	15/9
,, 5½% Cum. Pref. (£10)	£11/2/6	£11/2/6
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£104	£104
Bradford Dyers' Association, Ltd. Ord.	9/4½	9/4½
,, 5% Cum. Pref.	11/10½	11/10½
,, 4% 1st Mort. Perp. Deb. (£100)	£84/10/-	£84/10/-
British Celanese, Ltd. 7% 1st Cum. Pref.	27/3	26/9
,, 7½% Part. 2nd Cum. Pref.	22/-	22/9
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/-	5/-
,, 4% 1st Mort. Deb. Red. (£100)	£91	£91
British Cyanides Co., Ltd. Ord. (2/-)	3/3	3/7½
British Drug Houses, Ltd. Ord.	20/-	20/-
,, 5% Cum. Pref.	22/6	22/6
British Glues and Chemicals, Ltd. Ord. (4/-)	6/-	5/3
,, 8% Pref. (Cum. and Part.)	29/4½	29/4½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	26/3	26/3
,, 4¼% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	115/-	115/-
,, 6½% Cum. Pref.	31/10½	31/10½
British Portland Cement Manufacturers, Ltd. Ord.	90/-	90/-
,, 6% Cum. Pref.	31/6	31/6
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	11/3	11/3
,, 5% Pref. (Cum.)	17/6	17/6
Cellulose Acetate Silk Co., Ltd. Ord.	11/3	10/7½
,, Deferred (1/-)	1/10½	1/7½
Consett Iron Co., Ltd. Ord.	7/3	7/3
,, 8% Pref.	25/-	25/-
,, 6% First Deb. stock, Red. (£100)	£105/10/-	£105/10/-
Cooper, McDougall & Robertson, Ltd. Ord.	36/3	36/3
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	55/-	59/-
,, 5% Cum.	26/3	26/10½
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	30/-	28/9
,, 7½% "A" Cum. Pref.	30/7½	30/7½
Distillers Co., Ltd. Ord.	94/-	93/6
,, 6% Pref. Stock Cum.	31/-	31/3
Dorman Long & Co., Ltd. Ord.	19/4½	19/-
,, Prefd. Ord.	20/9	20/-
,, 6½% Non-Cum. 1st Pref.	21/6	21/6
,, 8% Non-Cum. 2nd Pref.	20/-	18/9
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£104	£104

Name.	July 16.	July 9.
English Velvet & Cord Dyers' Association, Ltd. Ord.	5/-	5/-
,, 5% Cum. Pref.	8/1½	8/1½
,, 4% First Mort. Deb. Red. (£100)	£65	£65
Fison, Packard & Prentice, Ltd. Ord.	38/9	38/9
,, 7% Non-Cum. Pref.	30/-	30/-
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	28/3	28/-
,, 3½% Maximum Stock (£100)	£90/10/-	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£109/10/-	£109/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90/10/-	£90/10/-
,, 5% Deb. Stock, Red. (£100)	£116/10/-	£113/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£113/10/-	£113/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	12/6	12/6
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	30/-	28/9
Imperial Chemical Industries, Ltd. Ord.	35/6	35/3
,, Deferred (10/-)	8/10½	8/6
,, 7% Cum. Pref.	33/6	33/6
Imperial Smelting Corporation, Ltd. Ord.	13/9	13/9
,, 6% Pref. (Cum.)	23/9	23/9
International Nickel Co. of Canada, Ltd. Cum.	$27\frac{3}{4}$	$26\frac{3}{4}$
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	95/-	95/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	107/6	107/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	5/7½	5/7½
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros. Ltd. 7% Cum. Pref.	32/6	32/6
,, 8% Cum. "A" Pref.	32/6	32/9
,, 20% Cum. Prefd. Ord.	78/1½	79/4½
,, 5% Cons. Deb. (£100)	£109/10/-	£109/10/-
,, 4% Cons. Deb. (£100)	£105	£105
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£58	£58
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/10½	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	42/-	42/6
,, 7% Cum. Pref.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£70	£69
Reckitt & Sons, Ltd. Ord.	115/-	114/4½
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	41/3	41/3
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co., Ord. (£100)	£125/10/-	£125/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£106/10/-	£106/10/-
,, Perpetual 3% Deb. (£100)	£88/10/-	£88/10/-
,, 5% Red. Deb. 1950/60 (£100)	£114/10/-	£113/10/-
Staveley Coal & Iron Co., Ltd. Ord.	43/9	44/4½
Stevenson & Howell, Ltd., 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	64/4½	68/1½
Unilever, Ltd. Ord.	32/6	33/1½
,, 7% Cum. Pref.	29/9	29/9
United Glass Bottle Manufacturers, Ltd. Ord.	41/-	41/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	20/-	20/-
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	6/6	6/6
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£101	£101

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no changes to report in general market prices this week. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works. Up to the present no prices for nitrogenous fertilisers for the new season have been announced, but, for July delivery, the prices in force for June continue unchanged.

LONDON.—There is no change in heavy chemicals. Steady conditions continue to be a feature of the markets, and in spite of the holiday influences there is a fairly steady demand. There are no changes of any importance to report, markets being firm. Pitch is quoted at about 35s. to 37s. 6d. per ton f.o.b. East Coast port for next season's delivery.

MANCHESTER.—The price position generally on the Manchester chemical market during the past week has been distinctly steady and in the few instances where any modification of recent levels has occurred the tendency is towards higher rather than lower rates. To some extent, although not very seriously so far, deliveries of many of the "bread-and-butter" lines have been adversely affected this week by industrial holidays in Lancashire, but apart from this there is a steady movement of most of the heavy products. Textile chemicals, however, are not improving noticeably compared with recent weeks, and the demand for these is only moderate. A few new contracts, mostly in the nature of renewals, have been put through since last report, although, as before, the bulk of the business booked since last report has been spread over comparatively short delivery periods. For the by-products inquiry this week has mostly been on a quiet scale.

SCOTLAND.—There has been an improved demand for chemicals for home trade during the week, but export business is still on a limited scale. Prices generally continue very firm at about previous figures with only slight changes to report. The Glasgow Fair holidays have had a definite quietening effect on the heavy chemical market, the principal business being for materials urgently required.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech, 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 5%, d/d U.K.

ACID, CITRIC.—11¾d. per lb., less 5%. MANCHESTER: 11¾d. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 1s. 0½d. less 5%. MANCHESTER: 1s. 0¾d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 to £23, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 to £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4½d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £4 2s. less 2½%.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 10s.; brown, £32 10s.

LEAD NITRATE.—£28 to £29 per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. to June 30; 6¾d. to 7¼d. from July 1 to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £36 to £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38 to £40.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £22. SCOTLAND: £20 15s.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3⅝d. per lb.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.: 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb
o-TOLUIDINE.—9½d. to 11d. per lb. *p*-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
CHARCOAL.—£5 to £10 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¼d. to 7½d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9½d to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5¼d. to 5¾d&. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 35s. per ton. LONDON: 40s. per ton, f.o.b. East Coast port. MANCHESTER: 32s. to 34s. f.o.b. East Coast.
PYRIDINE.—90/140, 5s. 6d. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—£7 5s. per ton delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.
NITRO-CHALK.—£7 5s. per ton in 6-ton lots carriage paid for material basis 15.5% nitrogen.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery in 6-ton lots carriage paid.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, July 17.—LINSEED OIL was firm. Spot, £23 per ton (small quantities); Aug., £20 10s.; Sept.-Dec., £20 17s. 6d.; Jan.-April, £21, naked. SOYA BAEN OIL was firm. Oriental (bulk), July-Aug. shipment, £18 5s. per ton. RAPE OIL was quiet. Crude, extracted, £31 per ton; technical, refined, £32 10s., naked, ex wharf. COTTON OIL was dearer. Egyptian crude, £23 10s. per ton; refined common edible, £27; and deodorised, £29, naked, ex mill (smallots £1 10sfl extra). TURPENTINE was steady. American, spot, 43s. per cwt.
HULL.—LINSEED OIL.—Spot quoted £21 7s. 6d. per ton; July, £21; Aug., £20 17s. 6d.; Sept.-Dec., £20 15s.; Jan.-April £21. COTTON OIL.—Egyptian, crude, spot, £24 per ton; edible, refined, spot, £27; technical, spot, £27; deodorised, £29, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £18 10s. per ton, naked. GROUNDNUT OIL.—Extracted, spot, £29 10s. per ton; deodorised, £32 10s. RAPE OIL.—Extracted, spot, £30 per ton; refined, £31 10s. SOYA OIL.—Extracted, spot, £21 10s. per ton; deodorised, £24 10s. COD OIL.—F.o.r. or f.a.s., 25s. per cwt., in barrels. TURPENTINE.—Tmerican, spot, 45s. per cwt. CASTOR OIL.—Pharmaceutical, 40s. per cwt.; firsts, 35s.; seconds, 32s.

New Companies Registered

British Tar and Chemical Co., Ltd.—Registered July 12. Nominal capital £100. Manufacturers, producers, refiners and distributors of and dealers in oil, tar, pitch, coke, asphalt, bitumen and all kinds of chemicals, lubricants, motor fuels, etc., and to adopt an agreement with Christopher Barber, Francis H. Rogers and Harold Talbot. A subscriber: Percy Reid, 217 Haydons Road, S.W.19.

Liquefied Gases, Ltd.—Registered July 13. Nominal capital £100. Mnaufacturers of and dealers in liquified gases of all kinds, petroleum, motor oils and spirits, etc. A subscriber: E. E. White, 431 Crescent Drive West, Petts Wood, Kent.

Moritz Chemical Engineering Co., Ltd.—Registered July 12. Nominal capital £2,000. Manufacturers of and dealers in machinery, plant, apparatus and implements used in connection with chemical engineering and allied industries, etc. Directors: Rene Moritz, Chatou (Seine et Oise), France, Jean Moritz, Chatou (Seine et Oise), France, Marcel Semet, 14 Palmer Street, S.W.1.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

SEPARATING AMMONIUM CHLORIDE.—Soc. D'Etudes Pour la Fabrication et L'Emploi des Engrais Chimiques. Dec. 21, 1933. 23240/34.

REACTION PRODUCT of butadiene derivatives with hydrogen halides and method of producing the same.—Marsene Corporation of America. Dec. 23, 1933. 28682/34.

ALUMINIUM AND ALUMINIUM ALLOYS, recovering and/or purifying.—Oesterreichisch Amerikanische Magnesit A.-G. Dec. 20, 1933. 31142/34.

HYDROCARBONS, method of coking.—Brassert-Tidewater Development Corporation. Dec. 18, 1933. 33162/34.

NATURAL ASPHALT, manufacture of solutions.—Dr. A. Wacker Ges. für Electro-Chemische Industrie Ges. Dec. 20, 1933. 33621/34.

ARSENOBENZENE-MONOSULPHOCYLATES, manufacture.—I. G. Farbenindustrie. Dec. 19, 1933. 33847/34.

ACETYL BENZOYL PEROXIDE, making.—Carbide and Carbon Chemicals Corporation. Dec. 22, 1933. 34297/34.

TREATING ORGANIC MATERIALS.—Dr. E. Franz. Dec. 18, 1933. 36176/34.

CRYSTALLINE COMPOSITIONS, production.—Carborundum Co. Dec. 18, 1933. 36178/34.

LUBRICATING OILS and process for preparing.—Resinous Products and Chemical Co. Dec. 20, 1933. 36194/34.

CONDENSATION PRODUCTS from phenols, formaldehyde, and amines, manufacture.—Röhm and Haas Co. Dec. 23, 1933. 36195/34.

MAGNESIUM HYDROXIDE, production.—I. G. Farbenindustrie. Dec. 23, 1933. 36208/34.

SULPHONATED PRODUCTS, production.—A. Beyer. Dec. 18, 1933. 36355/34.

CALCIUM CYANAMIDE, disintegration.—Bayerische Stickstoff-Werke A.-G. Dec. 21, 1933. 36404/34.

REFINING MINERAL OILS.—Aktiebolaget Separator-Nobel. Dec. 21, 1933. 36405/34.

CATALYTIC COMPOSITION for improving the combustion of solid fuels.—J. Burellier. Dec. 20, 1933. 36410/34.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Dec. 19, 1933. 36418/34.

MAGNESIUM, process of and apparatus for the production.—I. G. Farbenindustrie. Dec. 22, 1933. 36446/34.

CHLORINATED RUBBER, production.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. Dec. 19, 1933. 36453/34.

CONVERTING ALCOHOL INTO ETHERS.—Crima Soc. Anon. Dec. 20, 1933. 36462/34.

TREATMENT OF DYEINGS.—Deutsche Hydrierwerke A.-G. Dec. 19, 1933. 36468/34.

PRINTING TEXTILE MATERIALS with vat dyestuffs.—I. G. Farbenindustrie. Dec. 21, 1933. 36560/34.

ETHERS AND ESTERS of basically substituted enol compounds, manufacture.—I. G. Farbenindustrie. Dec. 20, 1933. 36604/34.

COKE-OVEN AND LIKE GASES, purifying.—Ruhrchemie A.-G. Dec. 21, 1933. 36609/34.

PRODUCTION OF ASPHALT or bituminous compositions containing rubber.—Internationale Vereeniging Voor de Rubber-en Andere Cultures in Nederlandsch-Indie. Dec. 23, 1933. 36687/34.

SUBSTITUTED AMINOCHRYSENES, manufacture.—I. G. Farbendustrie. Dec. 22, 1933. 36700/34.

CELLULOSE ESTERS, production.—E. I. du Pont de Nemours and Co. Dec. 21, 1933. 36704/34.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie.

Specifications Accepted with Date of Application

ACETOACETANILIDE, process for preparing.—Carbide and Carbon Chemicals Corporation. Dec. 2, 1933. 429,982.

GLYCOLS OR DERIVATIVES thereof, purification.—F. C. Stephan and Telegraph Condenser Co., Ltd. Feb. 8, 1935. 430,234.

REMOVAL OF IRON FROM WATER and salt solutions.—H. D. Elkington (Kamig Oesterreische Kaolin- und Montanindustrie A.-G.). Feb. 13, 1935. 430,235.

AZO DYESTUFFS, compositions for the production.—M. J. G. Bader. Dec. 12, 1933. 430,236.

UNSTABLE ORGANIC SUBSTANCES, method of preserving.—Wingfoot Corporation. Dec. 7, 1932. 430,335.

SYNTHETIC TANNING MATERIALS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 7, 1933. 430,343.

SAPONIFICATION OF ORGANIC ESTERS of cellulose.—British Celanese, Ltd., R. W. Moncrieff, F. B. Hill, and T. B. Frearson. Dec. 12, 1933. 430,349.

SAPONIFICATION OF CELLULOSE ESTERS.—British Celanese, Ltd. and R. W. Moncrieff. Dec. 12, 1933. 430,350.

SAPONIFICATION OF CELLULOSE ESTERS.—British Celanese, Ltd., R. W. Moncrieff, F. B. Hill and T. B. Frearson. Dec. 12, 1933. 430,351.

GREEN FOODSTUFFS, preservation.—Chemische Fabrik Kalk Ges. and Dr. H. Oehme. Dec. 12, 1932. 430,417.

HYDROCARBONS by the heat-treatment of carbonaceous materials, production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 15, 1933. 430,655.

YELLOW OXIDATION FERMENT and a coloured component derived therefrom, production.—Schering-Kahlbaum A.-G. Dec. 15, 1932. 430,571.

QUINONE AND HYDROQUINONE, production.—H. Palfreeman and N. Knibbs. Dec. 16, 1933. 430,572.

ANTHRAQUINONE DERIVATIVES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 18, 1933. 430,658.

LATEX, purification and concentration.—Rubber Producers' Research Association and H. P. Stevens. Dec. 18, 1933. 430,426.

DYESTUFFS OF THE INDANTHRONE SERIES, manufacture.—E. I. du Pont de Nemours and Co. Dec. 20, 1932. 430,358.

DYESTUFFS OF THE TRIARYLMETHANE SERIES, manufacture.—I. G. Farbenindustrie. Dec. 22, 1932. 430,499.

AMINO-SUBSTITUTED ORGANIC ARSENIC COMPOUNDS, manufacture. I. G. Farbenindustrie. Dec. 22, 1932. 430,575.

GLYCEROL AND GLYCOLS, manufacture.—E. I. du Pont de Nemours and Co. Dec. 23, 1932. 430,576.

Applications for Patents

(June 27 to July 3 inclusive.)

ANTI-RUST PIGMENTS, manufacture.—A. V. Blom and H. Schnyder. (Germany, June 30, '34.) 18796.

CONVERTING MIXTURE of alcohol, water, and ether into alcohol. R. de Blonoy. 19069.

HYDROGENATING FATTY ACIDS, process.—O. Brücke and Metallges, 18745.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 18459.

CONDENSATION PRODUCTS of the anthraquinone series, manufacture.—A. Carpmael (I. G. Farbenindustrie). 18949.

MORPHOLINE VINYL ETHERS, ETC., production.—Carbide and Carbon Chemicals Corporation. (United States, July 19, '34.) 18381.

DIETHYLAMINOETHANOL, manufacture.—Carbide and Carbon Chemicals Corporation. (United States, Aug. 25, '34.) 18656.

AMMONIA, METHANOL AND NITRIC ACID, production.—T. Chmura. 18824.

AMINES, manufacture.—E. I. du Pont de Nemours and Co. (United States, June 28, '34. 18619.

DYESTUFF PREPARATIONS for printing pastes.—W. W. Groves (I. G. Farbenindustrie). 18575.

ISO-ALLOXAZINE DERIVATIVES, manufacture.—F. Hoffmann-La Roche and Co. (Germany, Aug. 18, '34.) 18992.

MONOAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, June 29, '34.) 18576, 18577.

BASIC TRIPHENYLMETHANE, manufacture.—I. G. Farbenindustrie. (Germany, June 30, '34.) 18767.

STABILISED DIAZO COMPOUNDS, ETC., manufacture.—Imperial Chemical Industries, Ltd., and K. H. Saunders. 18618.

AMINES AND AMIDES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 18769.

VAT DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 18771.

DIAZO DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 18900.

SULPHUR FROM GASES, removal.—J. Y. Johnson (I. G. Farbenindustrie). 18901.

STARCH, manufacture.—Merco Centrifugal Separator Co., Ltd. 18697.

ALCOHOLS, production.—Naamlooze Vennootschap de Battafsche Petroleum Maatschappij. (United States, July 7, '34.) 19061.

ALKYL ESTER SALTS, production.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, July 3, '34.) 18465, 18466.

TREATING MIXTURES containing free acid, etc., esters.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, July 3, '34.) 18467. (Holland, April 1.) 18468. (Cognate with 18467.)

COMPOUND GLASS, manufacture.—H. E. Potts (Shawinigan Chemicals, Ltd.). 18508.

HYDROCYANIC ACID, recovery.—Röhm and Haas Co. (United States, July 9, '34.) 18582

From Week to Week

THE TELEPHONE NUMBER of the British Chemical and Dyestuffs Traders' Association has been changed to Royal 2758.

A GRANT OF £300 PER ANNUM for three years for the provision of scholarships or technical assistance in the Department of Clinical Investigations and Research in the University of Manchester, has been made by Boots Pure Drug Co., Ltd.

THE NOMINAL CAPITAL OF BAYER PRODUCTS, LTD., 31/4 Basinghall Street, London, E.C., has been increased by the addition of £20,000 in £1 unclassified shares beyond the registered capital of £30,000.

A MODERN STRIP MILL capable of producing 150,000 tons of tinplates and sheets a year is to be built at Redbourne, in Lincolnshire, by Richard Thomas and Co., Ltd., stated Sir William Firth, chairman of the company, at the annual meeting on July 15. The new works will cost about £1,000,000, and it is estimated that they will save £200,000 a year by cheapening production.

AN OPPOSED PETITION by the Cheshire United Salt Co., Ltd., for confirmation of a proposed reduction of its capital from £125,000 to £62,500 was heard by Mr. Justice Eve in the Chancery Division on July 15. Mr. Cecil Turner, for the company, stated that the nominal value of the shares was to be reduced from 2s. each to 1s. The loss was all being thrown on goodwill, which manifestly stood at a figure greatly in excess of its value. The company was one of the largest producers of salt outside the Association of Salt Manufacturers.

THE FOLLOWING AWARDS for 1935-1936 have been made by the Salters' Institute of Industrial Chemistry and approved by the Court of the Salters' Company: Fellowships have been renewed to G. Broughton, University of London, D. E. Wheeler, University of Bristol, and L. R. Barrett, University of Oxford; new Fellowships have been awarded to C. S. Windebank, University of London, E. I. Akeroyd, University of Cambridge, and T. K. Hanson, University of Oxford. The Salters' Institute has also awarded 150 grants-in-aid to young men and women employed in chemical works in or near London to facilitate their further studies.

THE BRITISH GAS FEDERATION has decided that the gas industry shall give active support to the heavy section of the British Industries Fair at Castle Bromwich next year. In an interview Sir David Milne-Watson, chairman of the British Gas Federation and governor of the Gas Light and Coke Co., said the gas industry had supported the Fair since its inception, but when the opening date of the Castle Bromwich section was changed to the end of May exhibitors felt that the combined effect of gas heating appliances and the warm weather to be expected at that time of the year would militate severely against an adequate inspection of the gas section. Reluctantly, therefore, the gas industry did not participiate in the 1935 Fair. The reversion to the original date removes that difficulty.

THE USE OF COLLOIDAL CLAY in soap making has given considerable encouragement to the china clay industry. Through the enterprise of the English China Clays, Ltd., "colloidal clay" has been produced under the firm's own patents, and they have achieved great success and also merited the highest commendation for placing the industry in such a position of tremendous possibilities. Such a task could never have been achieved by any individual firm, and since the amalgamation of the big three—the English Clays, Lovering, Pochin and Co., Ltd.—they have established a research department and a well-equipped laboratory with a competent staff in order that they might not only develop the known uses to which the china clay gel or colloidal clay are necessary, but to investigate other avenues where these high-graded clays might be applied with advantage to both consumer and producer.

A CHEMICAL TRADE GOLF COMPETITION was held on the Hoylake Golf Course of the Royal Liverpool Golf Club on July 11, when 86 players competed for the Sir John Brunner challenge cup, the John Rayner memorial cup, a scratch prize, and prizes for a four-ball foursomes against bogey. For the Sir John Brunner cup T. Dobell and N. D. Lees tied with 76 each, the former having a handicap of 5 and the latter 14; in the play-off, T. Dobell won. The Rayner memorial cup, played for by teams representing the chemical trade prior to 1926, was won by Synthetic Ammonia and Nitrates, average score all players, 87.09; Brunner, Mond, 87.90; Castner Kellner, 89.70; United Alkali, 90.33; The Rest, 92.04. Four-ball foursomes against bogey for prizes presented by D. Marsh and E. O. Glover were won by K. B. Robinson and G. M. Ashwell, 5 up; J. C. Law and R. H. Davidson, 3 up; who divided the afternoon sweepstakes. The morning sweepstakes were won by T. Dobell, N. D. Lees, R. W. Partington and G. B. Halley. The scratch prize was won by J. C. Law with a score of 79. Mr. A. E. Peak, chairman of the Chemical and Allied Employers' Federation, presided, and presented the prizes after dinner, at which 85 players and friends were present, including Mr. Frank Sharples, captain of the Royal Liverpool Golf Club, Sir Christopher Clayton, Mr. W. C. Glover, Mr. A. S. Cross, Mr. E. G. Williams and Dr. H. S. Hirst.

UNIVERSAL INDUSTRIAL DEVELOPMENTS, LTD., 54 Victoria Street, London, S.W.1, has increased its nominal capital by the addition of £6,000 in £1 shares beyond the registered capital of £30,000.

TWO WORKMEN WERE SLIGHTLY INJURED in an explosion at the factory of the Firestone Tyre and Rubber Co., Ltd., Great West Road, Brentford, July 14. They were working near the vertical air-receiving compressor plant when the accident happened.

BRITISH DRUG HOUSES, LTD., has called an extraordinary meeting for August 7 to consider a resolution to increase the capital. It is proposed to raise the capital to £750,000 by the creation of 108,000 new preference shares ranking *pari passu* in all respects with the existing 242,000 preference shares of £1 each. The proceeds of the issue will be utilised to repay the bank loan and to finance further developments and improvements.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

AMALGAMATED OXIDES, LTD., London, W.C. (M., 20/7/35.) Reg. July 5, agreement to execute deb. securing all moneys, etc., due or to become due to Stewarts and Lloyds, Ltd., 41 Oswald Street, Glasgow; general charge.

HOWROYD, McARTHUR AND CO., LTD., Liverpool, manufacturers of tanning extracts. (M., 20/7/35.) Reg. July 4, deb., to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; general charge (subject, etc.). *£16,200. June 26, 1934.

PAULSGROVE LIME WORKS, LTD., London, W.C. (M., 20/7/35.) Reg. July 3, £4,000 debs.; general charge. *——. Apr. 24, 1935.

PENWYLLT LIME CO., LTD. (M., 20/7/35.) Reg. July 5, £250 mort., to R. Jenkins, 72 Victoria Avenue, Porthcawl; charged on lime kilns, quarries, buildings, etc., at Penwyllt. *£300. Dec. 31, 1934.

UNITED PREMIER OIL AND CAKE CO., LTD., London, E.C. (M., 20/7/35.) Reg. July 9, Trust Deed dated June 19, 1935, securing £500,000 4¾ per cent. 1st deb. stock and premium of 2 per cent. present issue £400,000; charged on certain specified shares, also general charge. *£298,444. May 24, 1934.

Satisfactions

BIRMINGHAM CRUCIBLE CO., LTD. (M.S., 20/7/35.) Satisfaction reg. July 5, of charge reg. June 23, 1933.

BRYTE (1928), LTD., London, W., mfg. chemists. (M.S., 20/7/35.) Satisfaction reg. July 9, of deb. reg. Sept. 19, 1934.

NOR-RUST LIQUID LEAD CO., LTD., London, W. (M.S., 20/7/35.) Satisfactions reg. July 8, of deb. reg. May 20, 1932, and of charges reg. Nov. 8, 1934, Jan. 21, 1935, Feb. 5, 1935, and Feb. 15, 1935.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

KEW CHEMICAL CORPORATION, LTD., Marsh Works, 53 Marsh Lane, Preston, manufacturers. (C.C., 20/7/35.) £10 6s. 5d. June 17.

LUFF, Frank, 17 George Lane, Marlborough, metallurgical chemist. (C.C., 20/7/35.) £17 8s. 6d. May 15.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—A Sydney firm of manufacturers' representatives desires the representation for the whole of Australia, on a commission or consignment basis, of United Kingdom manufacturers of chemicals and drugs and essential oils. (Ref. No. 59.)

Canada.—A recently-established firm of manufacturers' agents at Ottawa desires to obtain United Kingdom agencies for the sale of chemicals, drugs and druggists' sundries and allied goods to be sold to chemists' shops, the medical profession and the department store trade, on a commission basis; they sell direct to the retail trade, including the department stores, and are understood to have good connections in Ottawa and Montreal districts. (Ref. No. 64.)

Canada.—A manufacturers' agent from Montreal is now in the United Kingdom for the purpose of obtaining agencies for merchandise saleable to druggists, to be sold on a commission or purchase basis in Eastern Canada. (Ref. No. 65.)

New Zealand.—The British Trade Commissioner at Wellington reports that the New Zealand Public Works Department is calling for tenders, to be presented in New Zealand by October 1, 1935, for the supply and delivery of 30 seamless steel acetylene gas cylinders complete with outlet valves and protecting caps. (Ref. T.Y. 5064.)

South Africa.—A reputable firm of manufacturers' agents established in Johannesburg desire to secure the representation of United Kingdom manufacturers of physicians' and surgeons' supplies for the whole of the Union of South Africa. (Ref. No. 72.)

Iran.—The Commercial Secretary to H.M. Legation at Tehran reports that the Kampsax Consortium is calling for tenders, to be presented in Tehran by August, 5, 1935, for the supply and erection of seven installations for softening water (by quick lime and soda or by quick lime only) used for feeding locomotives. (Ref. T.Y. 5042.)

Siam.—The British Consul-General at Bangkok reports that the Royal State Railways of Siam are calling for tenders, to be presented in Bangkok by August 12, for the supply of 1,000 five-gallon drums of black bituminous solution. (Ref. T.Y. 15.)

Colombia.—A leading firm of agents in Bogota desires to represent, on a commission basis, United Kingdom manufacturers of heavy chemicals. (Ref. No. 79.)

Company News

British Celanese.—The directors announce the payment on July 31 next of a half-year's dividend on the 7 per cent. first cumulative preference shares. This brings the payment on these shares up to April 30, 1933. A year's dividend was paid in April last. The dividend on the second preference is paid to April 30, 1930. No dividend has yet been paid on the ordinary shares.

National Canning Co.—An ordinary dividend of 5 per cent., less tax, is announced, the same as that paid the previous year. The distribution for 1933 amounted to 7½ per cent. A sum of £7,000 is allocated to reserve, compared with £8,000, and the carry-forward is raised from £2,250 to £8,327. For the year ended May 31, 1934, the net profit amounted to £30,086.

Zinc Corporation.—The total profits for 1934 including interest, dividends, etc., less directors' fees and taxes, are up from £120,225 to £131,226. The appropriation for mine development and new plant is down from £70,000 to £40,000. The ordinary share total dividend is raised from 12½ per cent. to 15 per cent., and the preference shares receive a participating dividend of 7½ per cent., against 6¼ per cent.

Courtaulds, Ltd.—The payment of an interim dividend of 2½ per cent., tax free, is announced on the ordinary shares. This compares with 1½ per cent., tax free, paid at this time last year, when the final dividend of 6 per cent., making 7½ per cent., tax free, increased the total distribution by 1½ per cent. The directors state that they have decided on an interim distribution of 2½ per cent. with the sole object of more nearly equalising dividends, as foreshadowed in the chairman's speech at the annual meeting in March last.

Eastwoods Cement, Ltd.—The annual report to March 31 last shows that trading profits have expanded by £18,102 to £50,570. In addition, there is a profit on realisation of investments of £4,635. Net profits are reported to be over £15,600 higher at £34,389, after providing for an increased allocation for depreciation, in addition to placing the profit on realisation of investments of £4,635 to "obsolescence." This net profit compares with the previous highest of £24,634 in 1929-30. The dividend is doubled at 15 per cent. for the year, with a final dividend of 10 per cent. This is the highest distribution since the company was registered in 1925. General reserve is increased by £4,000, against £1,000; and £9,520 is carried forward, subject to directors' additional remuneration.

APPOINTMENTS VACANT

(2d. per word; minimum 18 words; 3 or more insertions, 1½d. per word per insertion. Sixpence extra is charged when replies are addressed to box Numbers.)

CHEMICALS—Experienced Sales Manager required with thorough knowledge of marketing and who has expert technical knowledge of Solvent and Lacquer Industries. Excellent progressive position for right man. Copy references, full details of past experience, and salary required, must be stated. Apply Box 139, 191 Gresham House, London, E.C.2.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

Assistant, Grade II, required at the Building Research Station for work on problems connected with painting and decoration. Candidates should possess a degree in chemistry and should have practical experience in the application and general utilisation of modern painting materials, in addition to a general knowledge of paint technology.

The salary scale is £313 11s. 0d. rising by increments to £384 19s. 0d. Superannuation provision is made under the Federated Superannuation System for Universities.

Application should be made not later than July 31 on a form to be obtained on request (by postcard) from the Establishment Officer, Department of Scientific and Industrial Research, 16 Old Queen Street, S.W.1.